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The EDISON ELECTRIC INSTITUTE BULLETIN

December 1956

The Electric Industry in 1956 and Beyond
Donald S. Kennedy

Tomorrow's Opportunities in Employee Relations
F. L. Larkin, S. F. Leahy
H. L. Bowen, Edmund J. Thimme

1957 Housepower Program

Power Plant Design for Large Liquid-Cooled Generator
J. P. Fitzgerald, C. F. Paulus

EEI Resuscitation Awards

The Credit Picture

Published Monthly by Edison Electric Institute

ELECTRICAL RESEARCH STATISTICS
THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

(Includes Investor-Owned Companies, Cooperatives, and Government-Owned Utilities)

September, 1955-1956

SOURCE AND DISPOSAL OF ENERGY—MONTH OF SEPTEMBER

	1956	1955	%
NET GENERATION* (Kwhrs in Thousands)			
By Fuel Burning Plants	39,859,141	38,146,177	+ 4.5
By Water Power Plants	8,959,901	8,179,902	+ 9.5
Total Generation	[illegible]	46,326,079	+ 5.4
Add—Net Imports Over International Boundaries	442,600	89,728	....
Less—Company Use	127,254	129,984	− 2.1
Less—Energy Used by Producer	1,208,710	937,899	+35.3
Net Energy for Distribution	[illegible]	45,347,924	+ 5.6
Lost and Unaccounted for	[illegible]	3,181,020	− 3.2
Sales to Ultimate Customers	[illegible]	42,166,904	+ 6.2

CLASSIFICATION OF SALES

NUMBER OF CUSTOMERS—As of September 30th			
Residential or Domestic	[illegible]	44,090,477	+ 2.9
Rural (Distinct Rural Rates)	1,698,523	1,655,719	+ 2.0
Commercial or Industrial:			
Small Light and Power	6,140,466	6,052,832	+ 1.4
Large Light and Power	[illegible]	290,072	+ 3.0
Other Customers	[illegible]	170,208	+ 2.2
Total Ultimate Customers	52,696,914	52,259,398	+ 2.7
KILOWATTHOUR SALES—During Month of September (Kwhrs in Thousands)			
Residential or Domestic	10,784,980	9,812,100	+ 9.9
Rural (Distinct Rural Rates)	1,200,444	1,213,089	− 1.1
Commercial or Industrial:			
Small Light and Power	7,950,516	7,475,958	+ 6.3
Large Light and Power	23,140,852	22,028,520	+ 5.1
Street and Highway Lighting	391,850	355,891	+10.1
Other Public Authorities	926,040	873,731	+ 6.0
Railways and Railroads:			
Street and Interurban Railways	180,691	194,301	− 7.0
Electrified Railroads	149,532	159,699	− 6.4
Interdepartmental	55,488	53,615	+ 3.5
Total to Ultimate Customers	44,786,393	42,166,904	+ 6.2
Revenue from Ultimate Customers (Thousands)	$741,999	$695,983	+ 6.6

RESIDENTIAL OR DOMESTIC SERVICE

AVERAGE CUSTOMER DATA—For 12 Months Ended September 30, 1956			
Kilowatthours per Customer	2,929	2,700	+ 8.5
Average Annual Bill	$76.45	$71.82	+ 6.4
Revenue per Kilowatthour	2.61¢	2.66¢	− 1.9

* By Courtesy of the Federal Power Commission.

THE EDISON ELECTRIC INSTITUTE BULLETIN is published monthly by the Edison Electric Institute, an association of electric light and power companies in the United States and its territorial possessions. Its affiliate members consist of members of the Canadian Electrical Association.

The objectives of the Edison Electric Institute are:

The advancement in the public service of the art of producing, transmitting, and distributing electricity and the promotion of scientific research in such field.

The ascertainment and making available to the members and the public of factual information, data, and statistics relating to the electric industry.

To aid its operating company members to generate and sell electric energy at the lowest possible price commensurate with safe and adequate service, giving due regard to the interests of consumer, investor, and employee.

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The EDISON ELECTRIC INSTITUTE BULLETIN

December, 1956

Vol. 24 No. 12

Articles, Speeches, Reports

The Electric Industry in 1956 and Beyond
Donald S. Kennedy 391

Tomorrow's Opportunities in Employee Relations..... 395

The Industrial Relations Department
F. L. Larkin 395

The Supervisory Staff
S. F. Leahy 397

The Employees in General
H. L. Bowen 399

The Labor Organizations
Edmund J. Thimme 401

Double-Action HOUSEPOWER Program Planned for '57 .. 403

Power Plant Design for Large Liquid-Cooled Generator
J. P. Fitzgerald and *C. F. Paulus*..... 407

The Credit Picture..... 415

News, Notes, Miscellany

Conventions and Meetings..... 390

Residential Promotion Features 13 Activities..... 406

Philadelphia Mother Wins HOUSEPOWER Contest..... 406

Survey Shows No Let-Up in Electrical Power Expansion.. 412

EEI Makes Two Resuscitation Awards..... 413

University Selected for First Grant of Dow Fellowship.... 417

Personals 418

CONVENTIONS AND MEETINGS

1957

JANUARY

7 EEI-AGA General Accounting Committee "Yardsticks" Projects Group, EEI Headquarters, New York, N. Y.
9 EEI Home Service Committee, Edgewater Beach Hotel, Chicago, Ill.
10-11 EEI Live Better . . . Electrically, Women's Conference, Edgewater Beach Hotel, Chicago, Ill.
14-15 AIEE 3rd National Symposium on Reliability and Quality Control in Electronics, Hotel Statler, Washington, D. C.
17-18 EEI Industrial Relations Committee, jointly with Personnel Section of Southeastern Electric Exchange, Sheraton Park Hotel, Washington, D. C.
17-18 EEI Industrial Power & Heating Group, Roosevelt Hotel, New Orleans, La.
24-25 PEA Prime Movers Committee, Roosevelt Hotel, Pittsburgh, Pa.
28-31 CEA Eastern Zone Sectional Meetings, Chateau Frontenac, Quebec, Canada
30-Feb. 1 EEI-AGA Taxation Accounting Committees, Atlanta Biltmore Hotel, Atlanta
31-Feb. 1 Missouri Valley Electric Association Industrial and Commercial Sales Conference, Hotel President, Kansas City, Mo.
31-Feb. 1 PEA Transmission and Distribution Committee, Penn Harris Hotel, Harrisburg, Pa.

FEBRUARY

4- 5 EEI Commercial Lighting Committee, St. Louis, Mo.
4- 5 EEI Dealer Coordination Committee, New Orleans, La.
4- 6 EEI Prime Movers Committee, Deschler Hilton Hotel, Columbus, Ohio
6 EEI-AGA Accounting Developments Service Committee, Sheraton Cadillac Hotel, Detroit, Mich.
7- 8 EEI-AGA 1957 Accounting Conference Final Working Committee Meeting, Sheraton Cadillac Hotel, Detroit, Mich.
7- 8 EEI Transmission and Distribution Committee, Netherland Plaza Hotel, Cincinnati, Ohio
7- 8 PEA Electrical Equipment Committee, Benjamin Franklin Hotel, Philadelphia, Pa.
11-12 EEI Electrical System and Equipment Committee, Somerset Hotel, Boston, Mass.
11-12 PEA Communications Committee, Hotel Americus, Allentown, Pa.
11-13 EEI Residential Lighting Committee, Cincinnati, Ohio
14-15 EEI Residential Promotion Committee, New York, N. Y.
14-15 EEI Commercial Electric Cooking and Water Heating Committee, Birmingham, Ala.
21-22 13th Annual Adequate Wiring Conference, Sherman Hotel, Chicago, Ill.
28-March 1 Pacific Coast Electrical Association Business Development Section, Sheraton-Palace Hotel, San Francisco, Calif.

MARCH

7 EEI Financing and Investor Relations Committee, Hotel Biltmore, New York, N. Y.
18-20 Northwest Electric Light and Power Association Business Development Section, Empress Hotel, Victoria, B. C.
21 EEI Industrial Relations Committee, Headquarters, New York, N. Y.

1957

21-22 Pacific Coast Electrical Association Engineering and Operating Section, Hotel Statler, Los Angeles, Calif.
28-29 Oklahoma Utilities Association Annual Convention, Tulsa, Okla.

APRIL

1 EEI Industrial Power and Heating Committee, Edgewater Beach Hotel, Chicago, Ill.
1- 3 Southeastern Electric Exchange 24th Annual Conference, Boca Raton Hotel and Club, Boca Raton, Fla.
1- 4 EEI Sales Conference, Edgewater Beach Hotel, Chicago, Ill.
3- 5 Missouri Valley Electric Association Engineering Conference, Hotel President and Municipal Auditorium, Kansas City, Mo.
8-10 EEI-AGA 1957 National Accounting Conference of Electric & Gas Utility Accountants, Sheraton Park and Shoreham Hotels, Washington, D. C.
18-19 EEI Industrial Relations Committee jointly with Personnel Sections of Indiana Electric Association and Ohio Electric Utility Institute, and Personnel Practices Committee of Pennsylvania Electric Association, Netherland Plaza Hotel, Cincinnati, Ohio
21-23 Rocky Mountain Electrical League Annual Spring Conference, Shirley Savoy Hotel, Denver, Colo.
24-25 Pacific Coast Electrical Association Administrative Services Section, Hotel La Playa, Carmel, Calif.
24-26 Northwest Electric Light & Power Association Engineering & Operation Section, Sun Valley, Idaho.
25-27 EEI Meter & Service Committee, Soreno Hotel, St. Petersburg, Fla.
28 EEI Purchasing and Store Executive Committee, Penn Sheraton Hotel, Pittsburgh, Pa.
29-May 1 EEI Purchasing and Stores Committee 10th Annual Meeting, Penn Sheraton Hotel, Pittsburgh, Pa.
29-May 1 EEI Accident Prevention Committee, Algiers Hotel, Miami Beach, Fla.

MAY

2- 3 EEI Transmission and Distribution Committee, Muehlebach Hotel, Kansas City, Mo.
5- 9 American Ceramic Society Annual Meeting, Statler Hilton Hotel, Dallas, Tex.
6- 8 EEI Prime Movers Committee, Tides Hotel, St. Petersburg, Fla.
15-17 Pacific Coast Electrical Association Annual Convention, Fairmount Hotel, San Francisco, Calif.
16 EEI Industrial Relations Committee, Headquarters, New York City
20-21 EEI Electrical System and Equipment Committee, Statler Hotel, Buffalo, N. Y.
23 EEI-AGA Accounting Division Time and Place Committee, AGA Headquarters, New York, N. Y.
24 EEI-AGA Accounting Division Orientation Meeting, EEI-AGA Headquarters, New York, N. Y.
31-June 1 EEI Financing and Investor Relations Committee, Edgewater Beach Hotel, Chicago, Ill.

JUNE

2- 6 EEI Annual Convention, Chicago, Ill.
19-21 CEA Annual Convention, Murray Bay, Quebec
23-25 Wisconsin Utilities Association Annual Convention. Accounting Section, King's Gateway Hotel, Land o' Lakes, Wisc.
23-26 Michigan Electric Association, Grand Hotel, Mackinac Island, Mich.

The EDISON ELECTRIC INSTITUTE
BULLETIN

The Electric Industry in 1956 and Beyond

By Donald S. Kennedy
President, Edison Electric Institute and President, Oklahoma Gas & Electric Co.

THE gigantic annual postwar strides of the electric utility industry were maintained in 1956, with new records set in production, sales, number of customers, average use per customer, atomic power development, and other aspects of growth and progress.

To serve the domestic, industrial, defense, and commercial needs of the approximately 168,000,000 people of the United States, the electric utility industry generated 601,000,000,000 kwhr of electricity in 1956. This huge production was 54,000,000,000 kwhr greater than in 1955. It was more than double that of 1949, and more than three times as great as in 1942.

In addition to the 601,000,000,000 kwhr generated by all components of the electric industry in 1956, another 84,000,000,000 kwhr were produced by industrial and railway generating plants, making a grand total of 685,000,000,000 kwhr produced in the U.S.A.

In 1957 it is anticipated that U. S. production will reach total generation of three-quarters of a trillion of kilowatthours.

Installed generating capability of the electric industry totaled 126,500,000 kw at the end of 1956, an increase of 6,700,000 kw over 1955. During the next decade it is estimated that more than 110,000,000 kw of net generating capability will be added to the present total. In general, orders for generating equipment are placed from two to four years in advance of installation, and additions scheduled for the years 1957, 1958 and 1959 now total 35,000,000 kw of capacity.

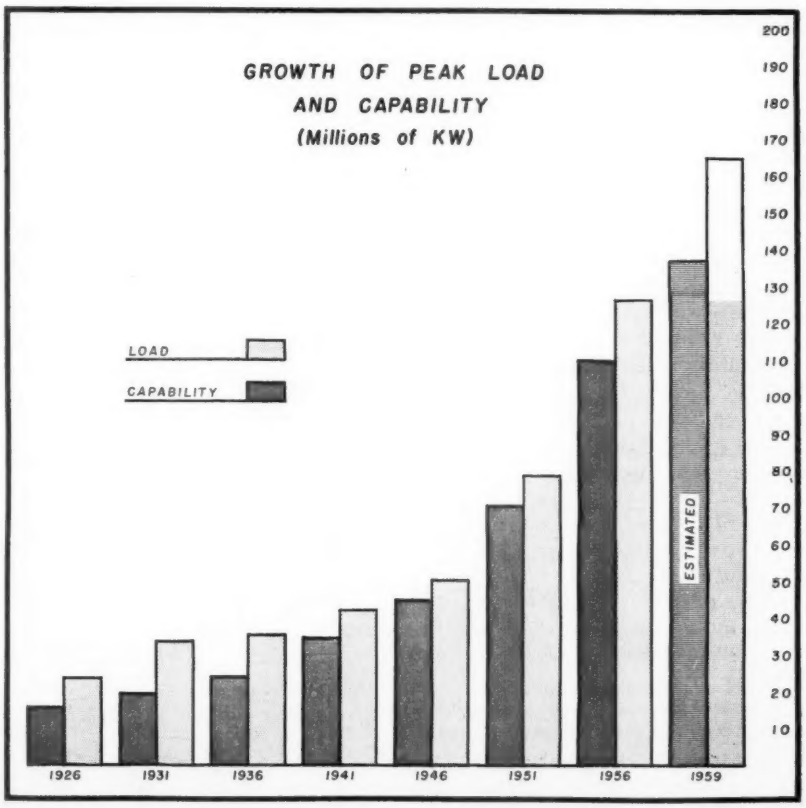
Additionally, orders in excess of 7,500,000 kw for the year 1960 and later have already been placed, or are in negotiation.

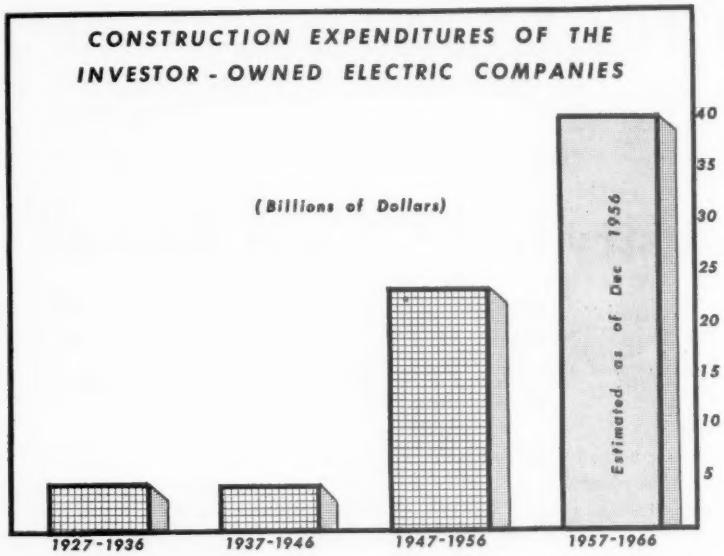
In perspective, the remarkable increases in production, sales and generating facilities of the electric industry are shown by the following tabulation:

	Ten Year Increase	Percent Increase 1956 over 1946
Generation	378 billion kwhr	170
Sales	338 billion kwhr	177
Capability	76 million kw	152

Of the approximately 43,000,000 kw of generating capability already scheduled for 1957 and beyond, 35,000,000, including more than 1,000,000 kw in atomic power plants, is planned for installation by the investor-owned companies, and 8,000,000 by the Federal government and other public agencies.

The gross margin between generating capability and peak demand in 1956 was down to 16,500,000 kw, an average of 15 per cent of total peak demand for the country as a whole, as compared with 17.9 per cent for 1955.





By 1959 gross margin is expected to increase to approximately 20 per cent.

Atomic Power Plants

Since the passage of the Atomic Energy Act of 1954, which permitted American industry for the first time to develop and construct its own atomic power plants, notable advances have been made by the electric companies towards the utilization of atomic energy as a source of fuel for generating plants.

At the end of 1956, some 49 electric power companies and associated service organizations were taking part in projects for the development and construction of 11 atomic power plants. Eight of these will have capacities of 60,000 to 236,000 kw.

Additionally, several other groups of companies are expected to announce projects for the development of nuclear-fueled plants in the near future.

Of the 11 plants already announced, one large and two small ones are scheduled to be in operation by 1958, three more large ones by 1960 and four large and one of a size not yet determined after 1960. The 11 plants with a total ultimate capability of over 1,300,000 kw will require an estimated expenditure by the power companies of over $350,000,000.

Construction of nine of these plants is to be accomplished entirely with investor funds, although the AEC will assist with research and development costs on at least two of this group. The other two plants are being built primarily by the AEC as part of its five-year, reactor-development program, with participation by electric power companies in the plant development and construction.

Investment and Construction Expenditures

At the end of 1956, investment in electric plant and property of the investor-owned electric companies was estimated to be $33,000,000,000.

Ten years earlier it was less than $13,000,000,000.

Expenditures for construction of generating, transmission, distribution and miscellaneous facilities by electric companies totaled approximately $2,900,000,000 in 1956. Construction expenditures during the past decade have averaged $2,300,000,000 per year.

Investment and Construction Outlook

Over the next 10 years construction expenditures by the electric companies are expected to almost double those of the past 10, to meet the growing demands for electric power.

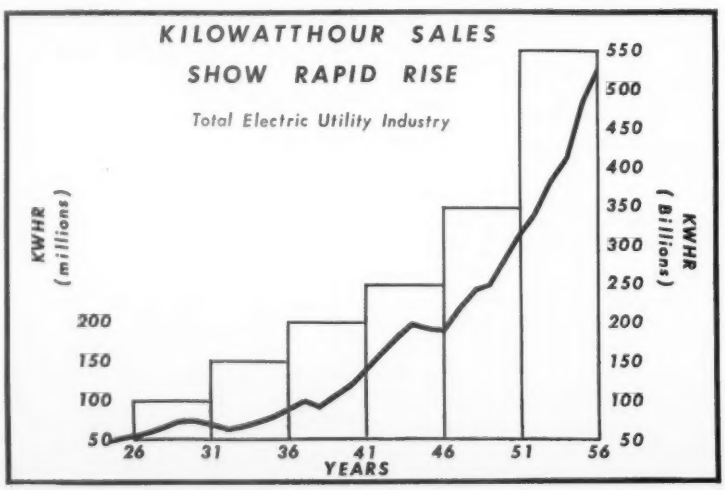
The addition in the decade now beginning of the anticipated more than 110,000,000 kw of new generating capability, with related facilities, should bring total construction budgets to an average of over $4,000,000,000 a year, with an upward range from the current rate of expenditure to about $5,000,000,000 per year by the end of 1966.

Electricity Sales

Total electricity sales reached 529,000,000,000 kwhr in 1956, an increase of 10 per cent over 1955. Industrial sales totaled 274,400,000,000 kwhr, a 10.1 increase over 1955. Sales to residential customers totaled 133,800,000,000 kwhr, an 11 per cent increase, and sales to commercial customers were 88,400,000,000 kwhr, a 9.4 per cent increase. Sales to other customers totaled 32.4 billion kwhr.

Gross electric revenue of the investor-owned electric companies amounted to $7,535,000,000 in 1956, an increase of 8.7 per cent over the preceding year. This total represented an increase of 141 per cent over gross revenue in 1946. Net income was $1,357,000,000, an 8 per cent increase over 1955 and 110 per cent over 1946.

Federal, state and local taxes consumed $1,790,000,000 of revenues



from electric company operations in 1956. This sum is equal to 23.8 per cent of gross revenue, and a 9.1 per cent increase over 1955. Federal taxes accounted for $1,100,000,000 and state and local taxes totaled $690,000,000.

Taxes in 1946, the first postwar year, totaled 20.6 per cent of gross revenue, and more than $1,000,000,000 less in that year than in 1956.

Wages and salaries totaled $1,330,000,000 in 1956, an increase of 5.1 per cent over 1955. Fuel, third highest item in the expense account, cost $1,235,000,000 during the year, 11.9 per cent over 1955.

Customers

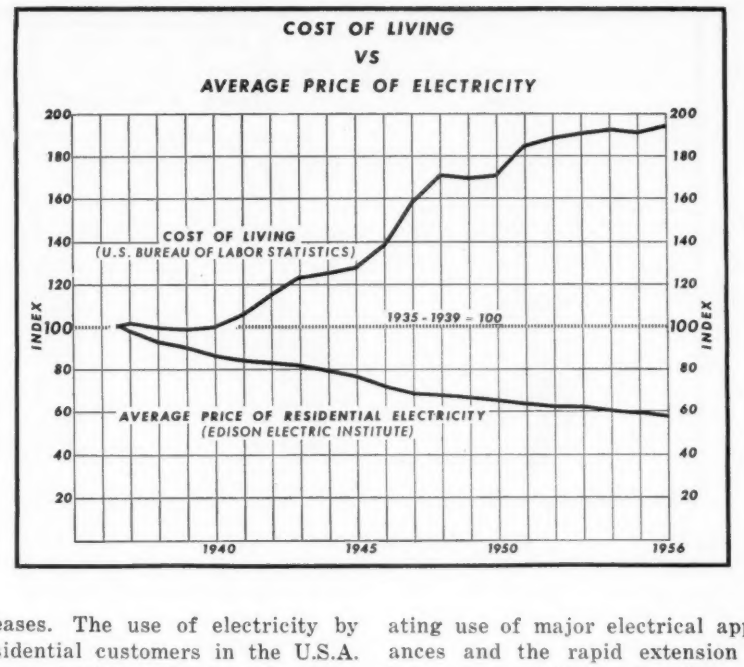
At the end of 1956 customers of the electric utility industry totaled 54,000,000, an increase of 1,440,000 over 1955. The establishment of new families and homes accounted for the greatest part of the year's increase. Electricity for several years has been in reach of nearly every American home, with over 98 per cent of occupied homes, urban and rural, connected for service. Customers at the end of 1946 totaled 36,000,000. In the 10-year period, residential customers increased by 16,000,000 or more than 50 per cent and commercial and industrial by 1,557,000 or 32 per cent.

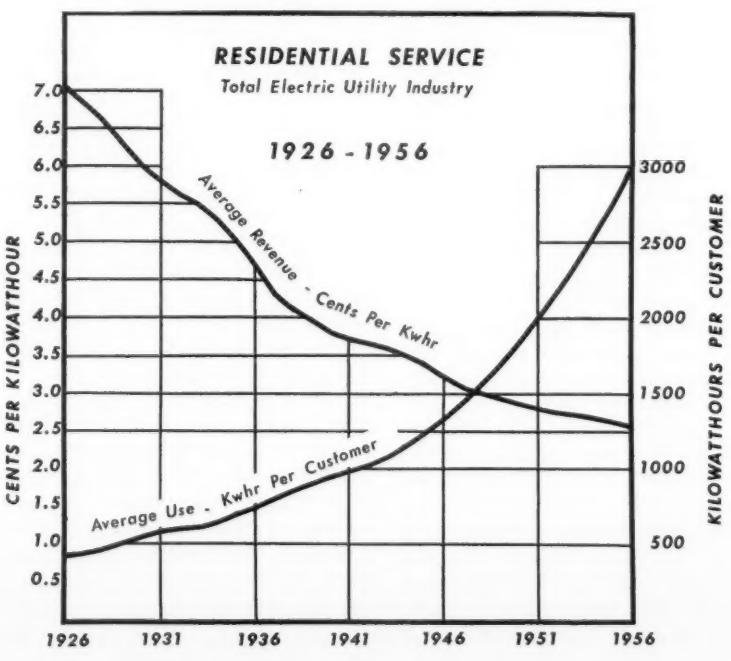
Electricity in the Household

Use of electricity in the home continues its phenomenal annual increases. The use of electricity by residential customers in the U.S.A. averaged 2,980 kwhr in 1956. This was an increase of 229 kwhr over the 1955 average, and the highest annual increase on record. The 10-year, 1946-1956, average annual increase in use was 165.1 kwhr, as compared with 55 kwhr in the preceding decade. Average annual use more than doubled between 1947 and 1956.

The wide-spread acceptance of electricity's contribution to better living as exemplified by the accelerating use of major electrical appliances and the rapid extension of home air conditioning, together with the practically universal use of promotional rate schedules, have been important factors in the great gains in domestic use of electricity.

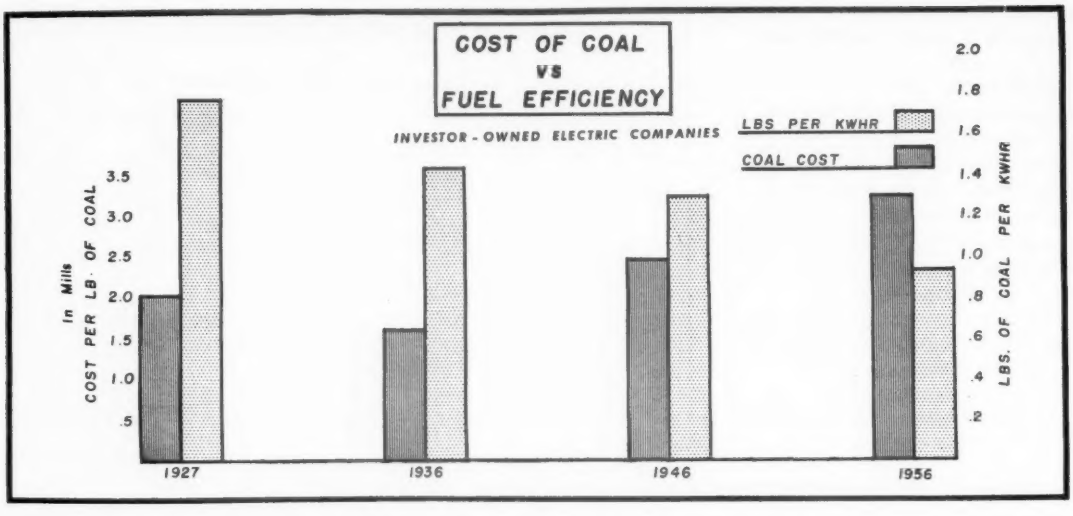
Despite modest rate increases, the cost to the consumer per unit of electricity has operated counterwise to the postwar advances in commodity costs and in incomes. This has occurred largely as a result of expanding consumption and the promotional character of electricity rates. Continuing refinements in equipment, operational improvements and efficiency increase in the new generating plants also contributed to making possible the apparent phenomenon. The average revenue per kilowatthour sold to domestic customers was 2.59 cents in 1956, a decrease of 19.6 per cent from the 1946 average of 3.22 cents. The 1955 average revenue was 2.64 cents.





Ownership of the Electric Industry

Stockholders in electric utility companies alone are now computed to be around 3,700,000, while those with indirect financial interest in electric company operations represent nearly the whole of American life. The 103,000,000 life insurance policyholders and the more than 21,000,000 depositors in mutual savings banks are examples of such indirect ownership, as are the members, shareholders or policyholders in various charitable and fraternal organizations, religious and educational institutions, foundations,



etc., which also are holders of public utility bonds.

The average fuel conversion efficiency of steam-electric generating plants is constantly increasing. In 1946, 1.29 pounds of coal were required, on the average, to produce a kilowatthour of electricity. In 1956, the figure was down to 0.93 of a pound—a reduction of 28 per cent. The figures quoted are for all plants, new and old. Newer generating plants produce even better results. One now under construction is expected to use only three-fifths of a pound of coal per kwhr of generation.

Transmission lines operating at 345,000 volts are now in use. A double circuit line of this type is estimated to have a capacity of more than eight times as great as that of a double circuit 132,000 volt line, which is a type now widely used.

1957 and Later

All indications point to a continuation of the ever-increasing demands for power by industry, business and the residential consumer in 1957. The endless search by industry for new methods by which electricity can be used to perform tasks more efficiently and economically, the high level of employment, the growing population, and the desire for additional time and labor saving electric appliances in the home and on the farm, are all factors which foretell of an increased demand for electric power in 1957 and ensuing years.

Discrimination Continues

The unfairness of commercial operations of the government in the electric power field, whereby over 42,000,000 customers of the investor-owned electric companies are penalized by the discriminatory provisions and interpretations of existing legislation, remains a matter of grave concern to the electric companies, and is of increasing importance to the taxpayers of the nation who are adversely affected in supporting commercial activities which do not carry their share of the nation's tax load.

Discriminatory provisions enjoyed by Federal power projects include their complete freedom from Federal taxation, and almost complete freedom from local taxes, and the exercise of the so-called "preference" clause in the sale of government-produced electricity to a favored group of customers.

As an illustration of the effect of the tax exemption provision it has been estimated that tax collections for 1956 would be increased by $360,000,000, if all suppliers of power had been on an equitable basis. In other words, some 11,400,000 electricity consumers, or 21.1 per cent of all electric power customers, escaped the Federal and some or all of the other tax elements of the electricity bills paid by customers of the tax-paying electric companies, through purchase of electricity from Federal, state and municipal suppliers.

The operation of the preference policy in Federal legislation "in effect, makes any customer of a non-publicly owned utility a second-class citizen so far as Federal power is concerned," Admiral Ben Moreell, former Chairman of the Second Hoover Commission Task Force on Water Resources and Power, has observed. "The company from which he buys power is denied Federal power," he continued. "His neighbor across the road or in the next town, served by a cooperative or a municipality, gets power for less than true cost while he, in his electric rate, pays local, state and Federal taxes in a greater amount because his neighbor pays nothing toward these ends."

Other Inequities

Another inequity of Federal power competition which penalizes the citizen, as a taxpayer, and in his inherent right to equal treatment under the law, is the fact that in addition to tax-exemption, under the law no interest is required to be paid by most Federal power projects on the billions of dollars appropriated for their construction.

While it is recognized that the correction of the major inequities in the marketing of governmental power lies largely in legislative action, there is cause for satisfaction in the fact that more and more Americans over the nation are asking why they and their neighbors should be taxed and otherwise penalized in order that the Federal government in a purely commercial operation may provide underpriced and tax-exempt electric power for a privileged class of citizens or for a favored state or region.

In the matter of preference distribution of governmentally produced power, opinion surveys show that among those who know of the preference discrimination nine out of 10 served by investor-owned companies and seven out of 10 of those benefitting from the discrimination are opposed to the working of the preference clause.

Tomorrow's Opportunities in Employee Relations

Excerpts from discussions at the 9th Annual EEI Industrial Relations Round Table Conference, Chicago, Sept. 17, 1956.

THE INDUSTRIAL RELATIONS DEPARTMENT

By F. L. Larkin

Vice President, Wisconsin Electric Power Co., Milwaukee

I WILL speak briefly of only a few areas in which Industrial Relations departments are not strong today and which I believe should be made a part of preparing the department to meet the future—areas which, if developed, will aid in the final solution of the employee morale problem.

First, a simple subject—Employment Procedures. Aside from centralizing, how many Industrial Relations departments have changed the procedures for selecting new employees in the last quarter century, despite the fact that there has been substantial development and refinement of scientific tools for selection. Industrial Relations people ought to know that no two people are precisely alike. They also ought to know that a primary cause of frustration and lack of job satisfaction is improper job placement—the misfit.

Among those who, from the usual or average employment screening, appear relatively equal—as desirable applicants—some will work best as members of a large group; others a small group; others will work best alone. Some will be happy and proficient with routine work, while routine will completely frustrate others. Some will be most satisfied with close supervision, while others will excel only under general or remote supervision.

If we have several vacancies for engineers—which we have—and by some miracle had a substantial number of applicants, and if some of the engineering jobs were quite routine in character, others involved considerable development work, and still others largely research, could your employment procedures tell you, with accuracy, at the employment office, with nothing to look at but the applicant's school, his course of study and his grades, which applicants will do best on the routine, which on the development work, and which on pure research?

Among the many devices to enhance morale is the privilege—the opportunity—to transfer to other work. Is performance on present work, is seniority, is a desire for transfer or promotion sufficient evidence of competency or incompetency to do the work of the other job? Obviously not.

If your employment procedures do not permit a high degree of accuracy in the type of selections I have enumerated, then for heaven sakes make that the Number One—the simplest—preparation for tomorrow's problems, because proper job selection can create or avoid many frustrations which will someday mean trouble.

Proper Selection Urged

I firmly believe that the greatest, almost terrifying responsibility of the Industrial Relations department for tomorrow is to do the best possible job in selecting people for promotions and transfers that lead to management work.

By "management" I mean the entire supervisory force from top to bottom. The numerical distribution of supervisory jobs forms a rough pyramid, greatest in number at the first level and tapering rapidly until you know how few are at the officer and department-head level. Fortunately or unfortunately, the Creator arranged for the distribution of competence of capacity to be distributed roughly in the shape of a pyramid, and there is no surplus of talent for the higher supervisory positions. Many top-shelf management people are never discovered because you have not developed a means of discovery; but believe me, gentlemen, your company, the industry, the nation cannot much longer afford the loss of executive talent resulting from failure to find it, nor can we much longer afford inferior substitutes.

Training is not the answer. Experience is not the answer because, whether you like it or not, the top-notch executive is born with the inherent capacity needed in management or he attains it as the result of early environment. By the time you get him, he either has the capacity or he doesn't have it.

You can look up a man's seniority record and work history. You can observe his competence on current work. You can peruse his college diploma. You can even canvass the opinions of supervisors who know the man well, but from none of this information can you determine, with any significant degree of accuracy, his maximum capacity for supervisory—management — work. Incidentally, the correlation between a college education and management capacity is not very good. It may be that a goodly proportion of college graduates become executives, but that doesn't prove that they are the best material available. It may be that they just look like the best.

Now some of you no doubt think I am talking a lot of gibberish—mumbo-jumbo. But some of you know that I am not—that it is possible to develop procedures which, with a very acceptable degree of accuracy, will separate non-supervisory from supervisory potential and, further, predict the maximum level at which an individual can function compe-

tently—whether or not the individual has ever been exposed to supervisory work.

But you cannot develop and administer such procedures with your present Industrial Relations staff; in fact, there is only one place to turn. You must have the skillful services of trained specialists in the field of industrial psychology and trained technicians to assist them.

Public utilities are companies where science has been applied to a high degree—that is, every place except the Industrial Relations departments. Just how scientific—how much engineering horse-sense—is used in establishing wage rates and ranges in the majority of utilities?

Certainly it requires no serious stretching of credulity to recognize that an examination of duties, responsibilities and job conditions would indicate that jobs have values, relative to each other. For example, in the X Light & Power Co. at the end of the war or on some earlier date a certain job A was worth half as much as job B and that relationship was recognized as proper.

But, what has happened? The X Light & Power Co. is one of those many companies which year after year has granted across-the-board, cents-per-hour increases. Whether or not the Industrial Relations people in the X Light & Power Co. realized what was happening is beside the point and water over the dam. The point is that there is a mess that the X Co. is going to have to clean up some day. Job A is being paid 70 to 80 per cent as much as job B.

And now what do we see? The X Light & Power Co. grants another 10-cents-per-hour, across-the-board plus 5-cents to certain categories "to correct inequities" which, if properly interpreted, means creating as many new inequities as it corrects—and the whole thing could have been avoided.

Before some people in this room were born, the engineering principles of analysis and synthesis had been successfully applied to the establishment of job values. But in the year of Our Lord 1956, how many utilities are using a sound system of Job Analysis and Evaluation?

I know of several utilities—and there are many more—where job analysis and job evaluation have been successfully used for as long as 20 years and for 20 consecutive years the across-the-board wage increases have been percentage increases so that job A is still being paid one-half as much as job B, and the union groups involved cannot be greatly different because there are AF of L, CIO, UMW and Independents. Those union groups, being familiar with job evaluation—and being parties to the establishment of rate ranges through the process of evaluation—would not dare accept a cents-per-hour increase. In one group of companies only once in 20 years did one union committee seriously demand cents per hour, and the membership voted for a percentage adjustment.

A sound system of job analysis and evaluation is an extremely valuable adjunct to proper placement of employees.

How can the characteristics of an individual employee be fitted to a job unless the relative importance of the many job characteristics are known? The usual job description is useful but inadequate. With a breakdown of the job into its many components and with relative values established for each component by serious-minded analysts you have an accurate template against which the employee can be measured.

Wage Inequities

It is very late, but it will never be earlier for the Industrial Relations department to prepare today for tomorrow's clean-up of wage inequities created—shall we say—by our predecessors.

Another device which I earnestly suggest that the Industrial Relations department seriously consider as another way to prepare for tomorrow's problems involving operating costs and employee morale is the use of incentive—and I don't mean anything as simple as a suggestion system.

It has been difficult for me to understand why, with few exceptions, utilities have stepped over and gone around the platinum mine that a good, sound incentive system can be. The only explanation I have had from representatives of other utilities is that "it would be impossible today" which, if we told the truth, simply means that it would take time and a lot of hard work.

An incentive system is aimed at and accomplishes the following objectives—every one a factor in employee morale:

1. It provides a measurement of performance and it is a well-known fact that supervisors improve in handling human relations much more if given an objective measurement of their operations which naturally results in discussions of such measurements with their subordinates.

2. It forces methods improvements through elimination of wasteful, undesirable practices which set a bad example for employee attitudes.

3. It creates a competitive spirit between work groups and thereby improves group loyalties which are normally morale building.

4. It reduces or eliminates the need for close, "breathing down the neck" supervision, and many recent studies have indicated that the avoidance of close supervision improves production and morale.

5. It forces organization changes, giving greater responsibility to non-supervisory employees.

6. It provides a natural selection procedure which turns the spotlight on employees with unusual abilities, particularly foremen whose groups consistently earn above average bonus.

And last, but certainly not least, if your company is to make progress toward the solution of the highly complex problem of employee motivation which must be solved if our way of life is to survive, and if we are to avoid organized labor or the deadly serious followers of Karl Marx from taking over industry and government, we had better tool up Industrial Relations departments to directly attack the problem of morale.

A great many things which have happened to the last two generations of employees have had adverse effects on attitudes and morale. To name just a few—increased size of industrial organizations with the inevitable increased remoteness of management; increased specialization and mechanization which, from the employee's point of view, has removed a sense of accomplishment and rendered some work insignificant; careless selection of supervisory personnel resulting from the hectic reorganization resulting from rapid growth; increased aggressiveness of those labor leaders whose

organizations and personal status thrive on conflict.

If the objective of Industrial Relations work is the full utilization of human resources, then the Industrial Relations department has a job to do which it is now ill-prepared to handle because it involves the development of management theories and practices which will use every concept of automation—methods improvement—while at the same time utilizing in a positive manner the major forces which influence human behavior—and that does not include the paycheck or Blue Cross benefits.

The topic of "Employee Motivation" has been oversimplified by some writers. It is not simple—not just a half dozen factors—not just a system or policy.

How much do we really know about the human being? How much do we know about the causes of aggressive or regressive behavior which change favorable attitudes to resentment and suspicion, if not attitudes which are compulsively destructive? How much do we know about the effects of the organization on individuals—small vs. large work groups; close vs. general supervision; employee-oriented vs. company-oriented supervisors; permissive vs. restrictive leadership; the effects of drawing employees into decision making; the possibilities of counseling—not only with employees but with supervisory people, who frequently need it more than their subordinates.

Very little! There is a critical need for accurate information. Progress toward increased productivity and raising the levels of job satisfaction and morale calls for fact-finding investigations which can only be done within industrial organizations in cooperation with some of the many clinics and research centers now in existence. The object of the search will be to determine how the worker reacts to factors inside and outside which influence his feelings, sentiments, attitudes and behavior on the job. Such research holds tremendous possibilities and it must be conducted by Industrial Relations people in order to prepare themselves to cope with tomorrow's "New Look."

In order to prepare now the Industrial Relations department for tomorrow's solution of the problem of employee motivation—"the will to work" — competent, technically trained psychologists and technicians must be added to the Industrial Relations staff.

We have gone from the chaotic era in which what passed as Industrial Relations responsibilities were functions of the line departments, through what in some companies were the excesses of centralization. The new advocates of decentralization, I believe, have the proper objective but the wrong approach. Industrial Relations work today, and certainly tomorrow, will require the skills of highly trained specialists. There is not a utility in the country big enough to have the necessary specialists in every line department. Perhaps a few could afford the cost, but it would be most wasteful.

We do not need decentralization—but rather "integration." The specialists from a central group must be accepted by the line departments as integral parts of the line organization working together for a common objective.

This ideal working relationship is present in many utilities today.

THE SUPERVISORY STAFF

By S. F. Leahy

Manager, Employee Relations, The Detroit Edison Co., Detroit

THOSE things which are needed most to make an effective organization today—motivation, teamwork, flexibility, cooperation—all are dependent primarily upon the type of leadership which is exercised. In our large organizations, this leadership makes itself felt at every level of management. The spirit of the organization is influenced not so much by its policies and benefits, but by its leaders and their concept of their responsibility to the organization and to their fellow workers. Their influence on the willingness of the worker to be on the job and to contribute his best efforts to the goals of the organization becomes a major factor in our success.

Management today is already facing tomorrow's problems. Nothing is more imperative than that we find ways to continually increase the effectiveness of our operations. One of our great responsibilities is to conduct our business in such a way that our service is increasingly available to more and more people. This means that we must effectively utilize the advances of science, engineering and technology, together with ever-improving management knowhow and methods to increase production and extend our service at decreasing economic costs. Fully as important, we must achieve this result not at the expense of human values but consistent with and improving the well-being of every employee associated with us. This calls for both technical competence and human relations skill at our first line of supervision.

Let me give you a few examples from our own experience to illustrate the point I am seeking to make. In studies which we made of our absence administration we have found further evidence of the significance of supervision in keeping absence to a minimum. In those groups having lowest absence rates, we discovered that the first-line supervisor generally has been given full responsibility in making decisions for granting time off with pay. Knowing the employee's record and needs, he is able to administer the plan equitably, both from the viewpoint of the company and that of the employee.

In another important area of operation the influence of the supervisor is felt. Specialization was believed to be the basis for high production. The result has been the development of many repetitive, monotonous simple tasks which have taken practically all of the satisfaction out of work for a good percentage of our employees.

As the fallacy of too much specialization has become apparent, companies have reversed the trend and adopted the principle of job enlargement. In simple terms, this is merely the building of more skill and responsibility back into our jobs. Results

in many cases have been highly encouraging. Production has increased and morale and attitude improved.

In one situation where job enlargement was introduced, 100 per cent of the men at one of our power plants reported they found their work much more interesting than it had been several years ago. A parallel survey in another plant where less job enlargement was present showed only 33 per cent reporting much more interest in their work.

Another example from our own studies relates to the development of cost concern in the organization. Continuing need to operate effectively requires that all members of the organization share the desire to avoid unnecessary cost and to improve methods of operation. A study of supervisor attitudes revealed that greatest concern for cost existed among those who had some responsibility for deciding how money should be spent. Where the problem of cost reduction was shared and employees' ideas invited on methods for reducing costs, greatest support was forthcoming.

Simplification Aids Productivity

Another contribution to effective operations through participation by the supervisor and the work group under his direction is work simplification. This approach to increasing productivity and eliminating waste has a special significance in preparing today's supervisor for tomorrow's problems since it relates, in a practical way, effective human relations and production goals.

The problems involved in technological change, including what we have come to think of as automation, the adaptation of electronic processing and the increasing application of electric power to production processes, have introduced some difficult technical and human relations problems. Although we are faced with the task of retraining and up-grading the skills of many supervisors and employees, this may not be the most difficult part of our problem. Resistance to change, fear of loss of security and job status, and other human problems can be the greatest obstacle to the utilization of needed technical advances. But here again the role of the supervisor and the manner in which he works with his employees appears to be a major factor in gaining cooperation to make these changes.

Recent studies of attitudes in our own company bear out this conclusion. Employees in several departments were asked to what extent they felt the company was more interested in cutting costs than it was in the people who worked for the company. In several groups, where technological changes were pending, significant difference of attitude on this point existed among employees. In those groups where supervisors had been most concerned with human relations and where morale and attitude were good, a relatively small percentage of the employees felt that the company was more interested in cutting costs than in its employees. This adds objective proof to the belief that good supervision can have considerable effect upon employee attitudes toward change.

Caught between our expectations and insufficient knowledge about how to supervise effectively, the supervisor is often under tremendous strain. On the one hand we are expecting him to meet high production standards and keep his costs down. At the same time we are exhorting him with principles of good human relations which require him to get results without pushing people around. We ask him to change his traditional way of doing things with no assurance that he will have our forgiveness if the new ways don't produce the results that are expected of him. The need is great for understanding his role and helping the supervisor acquire skill in exercising his important responsibilities.

The first-line supervisor is generally responsive when he is recognized as a key man and given a chance to operate as a part of management.

The foreman wants to fill his position and live up to his responsibilities when he is recognized as a key person. He often has his doubts, however, that he is being given more than token recognition as part of management. When we ask him how he sees his job, he often mentions his need for more latitude on decision making and better support on stands he has taken with his group. He asks for better information on management planning. Often he remarks about his lack of time to do an adequate supervisory job and his need for better preparation to handle problems of personnel and policy interpretation. A survey of 16,000 foremen made last year by Temple University gives us the following information:

- 44 per cent of the foremen said they are not consulted on policies.
- 45 per cent said they are not backed up on decisions.
- 35 per cent feel they are not part of management.
- 35 per cent feel communications are poor.
- 76 per cent don't know how they're doing.
- 58 per cent feel they need more authority to settle grievances.
- 60 per cent feel they get inadequate training in human relations.

The people under them have similar feelings about their supervisor's position. In a survey two years ago 54 per cent of the employees in one of our power plants said their foremen did not have enough authority to decide the things they should decide, and 41 per cent of the employees in a clerical department felt the same way.

Here are some questions to consider:

Can we do a better job of supervisor selection with emphasis on the ability and inclination of the individual to work through other people?

Bigger Management Role?

Can we do more toward giving the supervisor a larger part in solving management problems and making decisions?

Can we help the supervisor draw up a clearer definition of his job, as distinct from those above and below, to the end that he can measure the effectiveness of his performance? Along with this can we put emphasis on the way he does his job as well as on the results he gets?

Can we give him better guidance on planning and organizing his work and scheduling his time?

Can we improve the skill of the man he reports to in coaching and developing him, and in giving him a climate in which he can do his best work?

Can we set up patterns of communication that will enable him to act with greater confidence and understanding?

Can we give him better opportunity to grow in his technical field—to keep him abreast on research and new developments that affect him in his work?

These are the kinds of questions you will want to explore. They are broad questions and won't be answered by any single approach to the problem of supervisor development.

We want to help him get the attitudes, skills and knowledges he needs to do his job effectively.

There are three general patterns we can follow: We can work with him on an individual basis; we can develop him as part of his management team, and we can give him further education in the principles of good management and leadership.

The emphasis can probably best be kept on the individual development of each supervisor in his own situation. The responsibility for doing this rests with the man he reports to. It calls for continuing coaching and counseling—planning with the supervisor, delegating to him, directing through him. Regular appraisals of his performance can also be a part of this.

Proper delegation is a well accepted approach to developing a subordinate. Delegation is not always done well, as witness this collection of birds by Myles Mace in what he calls the family "Americanus Delegatus."

He names the "white-shirted hoverer," the boss who gives his subordinate a job and then flaps his wings right over him all the time. And the "pin striped whoopster," who gives a subordinate a job and then "whoopes" after him to keep him moving right down to the finish.

Next there is the "yellow-bellied credit-snatcher" and the "pussy-footed mouse trapper." Finally, Mace lists the "crested crown prince" who always lays his eggs in somebody else's nest. We've all met these "birds" and they could best be forgotten but they serve to point up the need for improving our approach to the indidual development of the supervisor into a full-fledged member of management.

A second approach to strengthening the supervisor is to work with the management team of which he is a part. These teams are organizational units such as a department head and the supervisors who report to him. As they plan together and work on common problems, the supervisor gets the feel of the team's thinking and shapes his own practices accordingly. This is a natural kind of development and recognizes the supervisor's dual role as a subordinate in one group and a leader in another. As I have mentioned, this team approach to supervisor development has been given much attention in my company.

Education along with other groups of supervisors is a third approach in which a number of management people with common needs can be brought together for training and exchange of ideas. Supervisor training has often emphasized the human relations aspects of the job. It could well be broadened to cover more of the administrative and technical skills of management. The technical demands on the supervisor especially are increasing and warrant the introduction of planned programs to meet his needs. The general education of the supervisor is important but calls for follow-up activities designed to assist on application of principles to the job itself.

Actually, these three approaches complement each other and all need to be carried on in some degree to get most favorable results.

Certainly we can agree that the supervisor's responsibilities have increased because of the management job he must perform. Any efforts to develop him and strengthen his position will be an important step toward meeting tomorrow's problems. We must act now—working through our people in middle management—to prepare the foreman for tomorrow's problems. We must decide to do a better job on the things we recognized a dozen years ago were needed to make supervisors into members of management. There are few tasks in industry today that are more important for building strong and effective management organizations to meet the challenges that lie ahead.

THE EMPLOYEES IN GENERAL

By H. L. Bowen

Manager, Industrial Relations, Georgia Power Co., Atlanta

OUR industry long ago recognized that it could not wait until loads had increased to the limits of existing capacities before undertaking the construction of new generating plants and transmission and distribution facilities. Hence, we have formed the habit of planning three, four, or five years ahead, estimating future loads and setting up construction schedules to assure always a margin of reserve capacity. In the same way, we must plan ahead to be sure our employees will be competent to operate the vastly enlarged and more complicated apparatus which growth and scientific innovation are introducing.

In an age as dynamic as the one we are living in, it is no longer sufficient for an employee to be trained for the tasks of the present. He must also be trained to adjust to, and take full advantage of, the new techniques and procedures which will confront him tomorrow and which are likely to drastically alter his activities.

We are going to need all the talent and ability we can get and, unless we start *now* to train our employees in the new processes and procedures, we simply cannot hope to achieve the maximum utilization of the human capabilities which represent our greatest potential asset.

Undoubtedly, automation will create new problems. Workers will be fearful that greater productivity per employee will result in fewer jobs and growing unemployment. But the fear that automation will eliminate jobs is unfounded. Instead, automation will upgrade jobs by creating the need for an unprecedented supply of highly skilled men. It is up to us to make our employees see this—to point out to them that greater productivity means higher wage scales and a higher standard of living. And the time to start this educational effort is *now*! Many of the technical changes which automation and atomic energy will bring about are already apparent and it is not difficult to predict the manpower problems which lie ahead.

Our immediate problem is the selection from our present work force of those employees who possess the educational background and desire for further training and development to fit into the requirements of tomorrow's higher productivity. This can be done to a large extent by job rotation and other on-the-job instruction,

together with specialized and supplementary training given by vocational schools, college evening schools, and correspondence schools. Some employees so obviously possess ambition, initiative, and imagination that they can be readily selected for such training without much chance of error.

For a great many others, however, it will take careful screening, testing, and counseling to be sure that our material is adequate and that our educational and training efforts will not be wasted or misdirected.

As a transitional step, and in order that we show ourselves humane as well as progressive, we will have to undertake to find useful ways to employ the limited skills of this group.

Clerical Workers Decline

Office workers, as well as production personnel, will be affected. The increase in the number and versatility of office machines is already creating a demand for more highly skilled operators. This demand will continue to grow. For many years the number of men engaged in clerical work steadily decreased, but now the number interested in learning office machine operation is found to be insufficient.

The potential scientists and technicians of the future, who will develop automation and the application of nuclear energy to industrial uses, are now in our high schools. In many high schools the scientific subjects—mathematics, physics, chemistry, and so on—are either not taught at all or are taught inadequately. Many students entering colleges—who have managed to take these subjects—find themselves poorly prepared in basic scientific preparation.

It is becoming increasingly necessary that we have an active presentation to make to these high school students which points out to them the advantages of a scientific education. To pursue the necessary courses of study, in most cases, they must start with their first year in high school. With such a presentation we will not only interest a larger number in pursuing engineering courses after they leave high school, but will be able to interest the boys who cannot attend college in entering our business and becoming skilled technicians through training on the job.

I am sure all of us are fully aware of the work we must continue to do at the college level, both with the students and faculty, to interest engineering graduates in entering the utility field rather than some other branch of electrical engineering. We lose many of the most promising young men to other types of work because they think the utility industry is static; that it offers little opportunity for creative imagination; that its best years of growth and development are behind. That misconception is our own fault. The rapid growth of our business, the application of nuclear energy to the production of electric power, and other technological changes represent opportunities which fairly stagger the imagination. No young man, however gifted, need lack opportunity for the full employment of his talents in the utility business.

The advance of technology will make demands upon our employees going beyond the increased technical skills which they will acquire. No doubt, the jobs of the future will require the full capacity of all employees rather than of the top management group alone. This dedication of their full abilities will come about only after the employee develops a full understanding of the business and its problems, and a greater willingness to accept responsibility.

Job Relations Stressed

Jobs must be made more interesting and each employee must understand the relation of his job to the other jobs in the company. With this knowledge he will generally feel a greater concern for the company's success. People in management, familiar as they are with the details of the business and engrossed in those details, often overestimate the amount of information our employees have been given. At the same time, we underestimate their interest in obtaining information.

In the public utility business it is important not only that the employee be well informed but that the company has a well-designed public relations program actively at work. It is recognized by all public relations people that a successful public relations program begins with the employees of the company. It is fundamental to a good public relations program to have each employee realize that public relations is a part of his job.

We must improve our techniques of communication. We sometimes take the easy way and try to make ourselves believe we are doing a thorough job of communication with such devices as employee magazines, reading racks, canned programs, pamphlets, published speeches, and other printed matter—and wonder why these media don't achieve results. This type of information defeats the purpose of real communications which must move freely in both directions.

Employees can be motivated by being shown how they can benefit and also how they can contribute. We all know these principles of communication, at least in theory. In practice, however, we generally spend more time in telling and exhorting than we do in listening and finding out what employees really want to know.

Wanted: Free Enterprise

Our industry seeks to operate as a part of the American free enterprise system against the opposition of those who would socialize our business. We have a peculiar interest in the free enterprise system and a great responsibility to share in the conduct of our government and to express our views on economic matters. In doing this, it is fundamental that we take our employees into our confidence and see that they understand and are able to discuss the principles upon which the American system, including our own industry, was founded. Our only salvation is through the economic education of the American people, and our own employees first of all.

We believe if all of our employees are informed about the company, its policies, and future plans, it will be easier to convince them that the aims of management and labor are not antagonistic but that, on the contrary, both are trying for the same result.

Industrial managers and engineers know a great deal more about the newer and better techniques in the fields of science and technology than they know about new and better techniques in the field of human relations. Every organization should apply as fully as possible scientific methods to human relations problems. It should develop a philosophy of life and should see to it that this philosophy pervades all policies and activities.

In conclusion, we can say that the employee of tomorrow will be a man or woman of higher training and greater skill than the employee of today. Through the use of automation the employee will have larger productive facilities under his direction and

will turn out a greater volume of goods or services. Because of the increased productivity and the increased investment in the machinery at his disposal he will command a higher wage. Since machines will take over to a greater extent the purely routine and automatic portions of his job, he will be called upon to exercise more judgment and human skill. This will require more native ability and a higher degree of training.

Preparing the employee for his more difficult and responsible job will impose a more difficult assignment upon management. In general, the employee will have to be given more and better information about his company. He will have to be given an opportunity for two-way communication. The methods used to make him fit into his environment will have to be more scientific and less haphazard. Opportunities for the employee to contribute to the company through its public relations activities must be provided.

His emotional requirements as a complex, educated individual must be recognized.

THE LABOR ORGANIZATIONS

By Edmund J. Thimme

Industrial Relations Manager, Electric Department, Public Service Electric and Gas Co., Newark

PLANNING in the industrial relations field is unique in that cooperation and support of the labor organization are essential in preparing for tomorrow's problems.

If we are to obtain this cooperation and support from the labor organizations, we must acquaint them with the nature of tomorrow's problems and present definite ideas as to the most effective means of solution.

It is expected that the population of the country will increase from 165,000,000 in 1955 to 204,000,000 in 1970. That means 39,000,000 more people to be provided with all of the things which are considered necessary or desirable for present living standards. Unless there is a decided change in human nature—and this is one development we do not anticipate—there will be further insistent demands for continually higher standards of living.

In 1955 the Gross National Product was $387,000,000,000. Various estimates have been made of the future GNP resulting from satisfying the needs of the additional population and the desire for higher living standards. A conservative average of these estimates for 1970 is $550,000,000,000, expressed in terms of current dollar value.

Similarly, disposable personal income is expected to increase from $270,000,000,000 in 1955 to $413,000,000,000 in 1970. A sizable portion of this income will be spent—we hope—and we believe it will—on electric appliances and energy-consuming equipment designed to provide an easier and more pleasant way of life. It is expected that electrical energy will be required to produce a large portion of whatever the additional income is spent on.

Realistic forecasts have been made of the effects of population growth, increased production, and higher income on the electric utility industry. From 1955 to 1970, average residential consumption is expected to increase from 2,750 kwhr to 7,700 kwhr; industrial consumption from 320,000,000,000 kwhr to 625,000,000,000 kwhr; and total consumption from 544,000,000,000 kwhr to over 1,400 billion kwhr. Generating capacity will increase from 117,000,000 kw to 320,000,000 kw.

Working Population To Drop

Although the total population will increase very substantially, the major increases are expected to be in the groups younger than 20 and older than 64, and the available labor force is normally considered to be drawn from the 20 to 64 age group. The 5 to 19 age group is expected to increase four times as fast as the 20 to 64 age group during the next decade, and the 65 and over group three times as fast.

With an increase in the working population of less than 20 per cent by 1970, Gross National Product will increase by over 40 per cent and electric production by almost 160 per cent. This means a large increase in per capita production—a substantially higher rate of increase. Much of this increase will come, of course, from technological progress, improved methods, and managerial competence. There is a very important additional factor—a highly skilled and versatile working force—interested, responsive, and willing to meet the challenge of production requirements.

The major problems with which we will be concerned, then, and for which we must prepare the labor organizations, are those related to productivity and efficiency. Since the solution of these problems is the basic objective of an industrial relations program, there is nothing new in their nature. The change will be only one of magnitude as we are faced with the need for a much higher rate of increase in productivity.

We have all witnessed attempts to limit the amount of work performed by an individual; to make the "honest day's work" something less than honest; to loosen quality as well as quantity standards; to overemphasize seniority in promotions and transfers to the point where the efficiency of the work force is adversely affected; and to limit flexibility by jurisdictional restrictions. These difficulties will continue to be encountered in our day-to-day operations and we can expect increased pressures along these lines.

Problems involving unreasonable economic demands will be lessened as we develop a better understanding of basic economics in our employees and their representatives, but these problems must be solved by and within the management group.

The basic objectives of labor organizations are higher wages—better working conditions—a continually improved standard of living. Who in this room does not have the same objectives? We can go a long

way toward solving our problems by showing the labor organizations how we can help them achieve those objectives — working together — by showing them that work limitations, inflexibility, and attempts to infringe on management functions and responsibilities will endanger their very reasons for existence.

Let's consider the union leader's position. Subject to heavy political pressures within the union—his continuance in office based on satisfaction of members' expressed desires—often committed to objectives which are in conflict—his job is not easy either. On the other hand, he knows the score—he realizes as well as we that production, profits, and the well-being of the union and its members go hand in hand. He can be of tremendous help in our production problems—and we cannot solve those problems without his help.

The first step—and many others—in preparing the labor unions for tomorrow's problems—must be taken within the management group. It is the formulation of a specific and forthright philosophy toward labor-management relationships. This philosophy must embrace sincere and unquestioned recognition of the union as the bargaining representative of our employees—the willingness to pay fair wages and to provide good working conditions—the desire for harmonious relationships —up, down, and across the entire organization—the objective of having the company considered a good place to work.

Let's be sure that we understand the industrial relations function. It is not a negative function—the technique of saying "no"—giving as little as we can—continually "fighting the union." It is a positive, creative, dynamic function—dedicated to efficiency, production, and progress—achieved with the understanding and cooperation of the union.

Having established our industrial relations philosophy, let's talk to the union about tomorrow's problems. Make it clear that you give sincere and unqualified recognition to it as the bargaining representative of your employees—not merely legal recognition—but a continuous, day-to-day recognition—based on respect for the union's functions and responsibilities. Make it just as clear that you expect equal sincerity and respect—the same recognition of management functions and responsibilities. Let the union know you intend to fulfill your responsibilities—that the union, in turn, must live up to its own responsibilities—if it wants them to be recognized and respected. Define those responsibilities—both the company's and the union's.

Assure the union that you will not in any way attempt to weaken the allegiance of your employees to the union—that by your actions you will let the employees know that you respect the union—that you will do nothing to undermine its prestige and status as the bargaining representative of your employees. This is extremely important. Without a feeling of security, the union will not be cooperative. In an "anti-union" atmosphere, the attitude of an employee toward his work will be adversely affected.

Employee Loyalty Necessary

Let the union know that you intend to build up the basic employer-employee relationship—and that you will not permit the union to raise a barrier between the company and its employees. Employees can be—and, in general, want to be—loyal to both the company and the union. Unfortunately, in many cases we have permitted the employer-employee relationship to break down — often through a sincere but ill-advised approach to improvement of the company-union relationship. Loyalty of employees to the company is essential to a productive and efficient tripartite relationship of company, employee, and union.

Be sure the union knows that you believe in fair wages and good working conditions—that you expect your employees to receive a fair share of the fruits of greater productivity. Be sure it also knows that you will resist any attempts to obtain more than its fair share—to the detriment of other groups entitled to similar consideration.

Tell the union that it can expect every member of management to abide by the terms of the agreement —that any grievance or complaint will be given full consideration—that the established procedure will be used in good faith for equitable resolution of differences. Let the union know you're human enough to anticipate an occasional mistake—and also that you are honest enough to correct it promptly.

This is all part of the preparation for tomorrow's problems—the building of a foundation of mutual confidence and respect—completely essential to the attainment of production and efficiency.

Inform the union that every member of management can be expected to operate in accordance with this philosophy—that there will be no arbitrary exercise of authority—but that there will be strict maintenance of discipline. The union cannot—and should not be expected to—maintain discipline for the company—particularly in the face of any laxity on the part of supervision. The union respects firmness—it can and will support proper discipline, administered uniformly, without discrimination.

Explain the relationship of anticipated production requirements to labor force growth—that an increase in individual productivity is essential.

Start with today's problems—since they haven't been solved—they are also tomorrow's problems. Talk about tardiness, absenteeism, soldiering—about abuse of the "coffee break" and "wash-up" time — about late starts, early quits, and lengthened lunch hours. Don't talk about these things as complaints—their existence is as much the fault of management as it is of the union—so let's talk about them as problems. Talk about feather-bedding, slowdowns, and jurisdictional restrictions. Emphasize the fact that all af these things lower production standards — waste badly needed manpower — and work against higher standards of living.

Then let's talk about the need for a more efficient working force—the training and development of the individual—high standards of requirements for promotion and transfer. Talk about improved work practices —the minimum use of manpower.

Discuss the manning of a new generating station—with unit-type generators, automatically controlled—the qualifications and training of employees for this station. Explain the need for flexibility and efficiency in maintenance of this equipment—to insure minimum time out of service. You'll be prepared for the manning of nuclear stations.

By all means, talk about equitable treatment for those employees who aren't adaptable to new operations—

(*Continued on page* 417)

Double-Action HOUSEPOWER Program Planned for 1957

The Activities of EEI and Allies Geared for Wider Consumer Identification and to Provide Greater Support and Leads for Selling Team

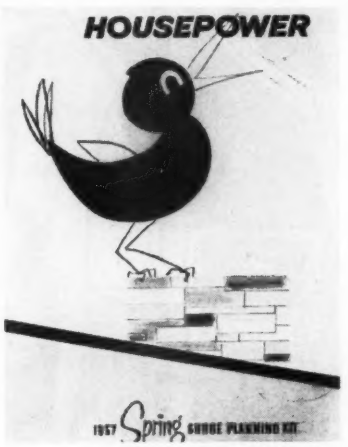
THE expanded HOUSEPOWER program for 1957, in addition to aiming for wider consumer identification, has the basic objective of providing greater support and leads for the selling team—contractor, dealer and utility sales personnel—through new sales merchandising aids, a coordinated national advertising program and a training course on selling strategy.

The immediate aims of EEI and other organizations participating in the HOUSEPOWER program were outlined earlier this month to press and industry representatives by E. O. George, chairman of the EEI Wiring Promotion Committee and vice president of The Detroit Edison Co. They are: to inform the consumer of the concept of HOUSEPOWER and to integrate the program completely with other industry activities. These objectives are part of the long-range goal to help modernize the wiring in 20,000,000 homes.

In a recent HOUSEPOWER progress report before the 21st Annual Conference of International Association of Electrical Leagues in Detroit, Milton I. Allen, member of EEI's Commercial Division Executive Committee, pointed out that the word "HOUSEPOWER" and its meaning have gained wide recognition. It is not only recognized by other elements of the electrical industry, contractors and labor, but by the consumer as well, he reported.

The major part of this education to HOUSEPOWER was credited by Mr. Allen to the local electric companies "who have demonstrated their faith in the need for this program by contributing local-action dollars and effort far in excess of the national effort." Effective newspaper advertising and television programs and HOUSEPOWER contests among its own employees are some of the methods used by local companies to make their communities aware of the need for adequate wiring.

In an effort to pre-sell the consumer on HOUSEPOWER in 1957, EEI will run a series of cartoon-type advertisements in *Saturday Evening Post* and *Better Homes & Gardens* beginning in February. These two magazines provide a net circulation of 9,000,000 and a single issue unduplicated audience of 26,750,000, covering 50 per cent of U. S. single-family homes and 40 per cent of all families with incomes of more than $5,000 a year. Coupled with ads scheduled by the National Adequate Wiring Bureau, National Electrical Contractors' Association and those of the "Live Better . . . Electrically" group, they will provide an estimated 161,000,000 reader exposures during the year. They are planned to lend support to the local Spring and Fall sales activities. In addition, EEI will participate in the NBC-TV "Home" show which has an estimated audience of 4,000,000. A closed-circuit "Live Better . . . Electrically" telecast on Jan. 30 will feature HOUSEPOWER.



The EEI HOUSEPOWER Spring Surge planning kit for 1957 will be distributed for local promotions. It will include 10 sales aids for the electric companies, contractors and others who sell wiring and power.

The second element of the program includes short-range, local selling-action programs following the national activity. EEI, NAWB and NECA will provide merchandising aids to complement this phase of the effort.

Prepared by EEI in cooperation with NECA for electric companies, contractors, distributors and electrical leagues, a HOUSEPOWER Forum is available in kit form and presents the latest sales approaches and techniques. It may be sponsored as either six two-hour meetings or three three-hour meetings to be held one night each week.

This course is designed to aid the contractor or anyone who is making wiring recommendations and proposals and includes: 1. "Planning Guide" to make the course as effective as possible; 2. "Conference Leader's Manual," telling how to conduct meetings, how to use materials and how to stimulate enthusiasm; 3. Audio-visual materials including two sound slide-films—"Lucky Seven" and "Visual Road to Sales"—the HOUSEPOWER record and "HOUSEPOWER Visual Presentation," a silent slide-film; 4. Seven "take-home" booklets which give contractors a complete sales manual on profitable selling of residential wiring when the course is finished; 20 sets of booklets are supplied with each course; 5. HOUSEPOWER visual sales presentation which the contractor may use in talking to prospects.

These are the areas covered in the meetings: Meeting No. 1—"The Market & Your Basic Selling Strategy"; No. 2—"How to Make Your Prospects Want Full HOUSEPOWER"; No. 3—"Faster Selling Through Selling Tools"; No. 4—"How to Overcome Objections and Stalls"; No. 5—"Getting the Job at a Profit"; No. 6—"How to Get All the Customers You Want."

As a supplement, NECA has developed a sales course which highlights techniques of estimating jobs and explores in more technical detail the "whys" and "hows" of home wiring.

National Electrical Week, Feb. 10-16, will be used as a springboard for

Slow heating up? *Shrinking picture?* *"Octopus" outlets?* *Fuse gone pfft?*

Somebody ought to tell them about full HOUSEPOWER TRADE MARK

Another fuse gone pfft? Home a maze of extension cords and double sockets plugged into double sockets? Appliances take too long to heat up? TV picture shrink? Lights flicker? Better get a HOUSEPOWER Rating on *your* home.

Truth is, 4 out of 5 homes suffer from low HOUSEPOWER (old-fashioned electrical wiring, outlets and switches). It's easy to find out if you're one of the four: just call your electrical contractor or electric company for a HOUSEPOWER Rating. If added wiring is needed to bring your HOUSEPOWER up to par, your electrical contractor will do the job quickly and neatly . . . economically, too.

During National Electric Week (February 10 to 16) lots of your neighbors will be getting HOUSEPOWER Ratings. So why not call your electrical contractor or electric company now. Remember, full HOUSEPOWER increases the value of your home—helps you LIVE BETTER ELECTRICALLY.

Your electrical industries sponsoring
HOUSEPOWER

This EEI-sponsored ad will appear in the February issue of *Better Homes & Gardens* and the Feb. 16 issue of *Saturday Evening Post* to kick-off the 1957 HOUSEPOWER promotion.

EEI's Spring selling-action program. The theme will be "How's Your HOUSEPOWER Rating?" and will combine NAWB's HOUSEPOWER Rating Sheets and the new NECA HOUSEPOWER Wiring Proposal and Estimate Form.

The Fall promotion will feature the utilization concept and integrates all industry programs. Its promotional elements are geared to generate leads for follow-up selling. Specific national support of the local-action programs are to be provided for both plans.

Mr. George promised "added emphasis in 1957 to assist and increase the teamwork that is making HOUSEPOWER such a dynamic force. There will be "improved contact and communications to smooth coordination and add momentum at all levels."

T. O. McQuiston, chairman of the EEI Commercial Division, in reviewing the HOUSEPOWER progress in the last seven months of 1956, after it was inaugurated in May, revealed that consumers are reading the messages and remembering them. He quoted from a survey indicating that HOUSEPOWER was identified correctly by 19.9 per cent of those interviewed three months after the promotion was started. This he compared with 28.6 per cent who correctly identified Shell's "TCP" after nearly four years' promotion; 23.4 per cent for "Halolight" after seven years; 25.2 per cent for "Fluoristan" after seven months and 53.4 per cent for "Dynaflow" after seven years.

Mr. McQuiston, vice president of Metropolitan Edison Co., revealed that three dollars were invested in national advertising by manufacturers in 1956 for every dollar spent by EEI.

The Wiring Promotion Committee, reviewing the 1956 HOUSEPOWER accomplishments, cited local utilities who have "enthusiastically promoted the program in their service areas." It further pointed out that "the HOUSEPOWER program has shown that utilities, electrical contractors, manufacturers and labor can be unified to work toward common goals."

Brief statements by representatives of three of EEI's industry allies and the "Live Better . . . Electrically" group who will cooperate in the 1957 HOUSEPOWER program are:

Andy Doremus, chairman of the Plan Committee, National Adequate Wiring Bureau: "We feel that our biggest contribution to HOUSEPOWER has been the HOUSEPOWER Rating Sheet. It is believed that during the coming year it will be one of the most rewarding aspects of this program. The HOUSEPOWER concept is being incorporated into other promotion elements. We've developed a decal which contractors will display on their truck doors or shop windows. HOUSEPOWER ad mats will be prepared.

"All of these will be part of a bargain package of promotion materials to help the contractor get started."

NAWB also plans advertisements in *Look, Home Modernization, New Homes Guide, House Beautiful's Building Manual* and *Better Homes & Gardens Book of Building.*

Arthur Bertke, chairman of the Business Development Committee for the National Electrical Contractors Association: "There's one aspect which is very near and dear to our hearts at NECA . . . that's the HOUSEPOWER Proposal Form. NECA is working now on a cooperative effort on this form. We're making sure that the entire NECA membership knows about the 1957 HOUSEPOWER campaign."

NECA will sponsor ads on HOUSEPOWER in *Time, U. S. News & World Report* and *Newsweek* to coincide with National Electrical Week in the spring and to support the EEI fall promotion in September.

Arthur Hooper, executive director of the National Association of Electrical Distributors: "It is the electrical distributor, his salesmen and countermen who are in daily contact with the electrical contractor, the man who is the key factor in the HOUSEPOWER program.

"With this in mind, NAED is planning a campaign to rally electrical distributors behind HOUSEPOWER and get them to talking HOUSEPOWER to contractors. Our function is to provide necessary local impact to get the rewiring job under way.

"NAED is preparing a kit of promotional tools, with plans and ideas to send out to our members. We are calling on the sales manager of every NAED firm to devise a program within his own company based upon tools in the kit. Salesmen, countermen—even telephone men—will be constantly urged to tell the story."

R. E. Boian, manager of the "Live Better . . . Electrically" project: "HOUSEPOWER messages are going to be included in our LBE ads in *Look, Collier's, Saturday Evening Post, Life, Better Homes & Gardens* and *Ladies' Home Journal.* They will appear in the spring and in the fall.

"On television, the HOUSEPOWER message will be spread. On Jan. 30, we're integrating HOUSEPOWER in our closed-circuit telecast. It will be seen by 30,000 people at that time and approximately 200,000 people will see the kinescope. And on national television, HOUSEPOWER will be a part of the commercials on the "General Electric Theatre." The ads in trade magazines will feature HOUSEPOWER during the early spring. Ad mats on HOUSEPOWER will be ready for the spring drive.

"We're getting out a Contractor Sales Kit, using HOUSEPOWER as the major theme."

Paul B. Juhnke

PAUL B. JUHNKE, 77, retired chief operating engineer of Commonwealth Edison Co., died recently at his home in Chicago.

Born in Germany, Mr. Juhnke at the age of 12 came to Chicago with his parents. He joined Commonwealth Edison in 1903 as an electrician's helper and established the company's first load dispatching department more than half a century ago. He was chief load dispatcher for the firm for many years. He was graduated from Lewis Institute where he studied electrical engineering. Lewis later merged with Armour Institute to become Illinois Institute of Technology.

Mr. Juhnke had been a director of the American Institute of Electrical Engineers and chairman of the organization's Chicago chapter. He had served also as chairman of the Western Society of Engineers' electrical section, president of Alexian Brothers Hospital Foundation and president of Lewis Union, forerunner of the Illinois Institute of Technology Alumni Association. Mr. Juhnke retired in 1947.

Residential Promotion Features 13 Projects

THE EEI Residential promotion program for 1957 includes a record 13 seasonal or year round promotional activities directed at both specific and general appliance sales.

Each activity will have its own theme, according to T. O. McQuiston, chairman of the EEI Commercial Division Executive Committee and vice president-general manager of Metropolitan Electric Co. Special dealer display material will be produced for 10 of them and for National Electrical Week. Among the new promotions are National Electrical Week, HOUSEPOWER New Homes and Residence Lighting.

The material prepared by EEI in support of the program, called "A Power Package" of ideas and slogans for electrical living, will contain suggestions and promotional pieces to help sell more appliances. A flasher display will be available for the Water Heater effort and a functional mobile and other point-of-purchase material included in the Spring Range kit.

Mr. McQuiston said that "only by coordinating local promotional campaigns with the national promotions can utilities take full advantage of the strong backing offered by the over-all program." Manufacturers are being informed of the EEI schedule and many are planning their promotions to conform with these. "This will mean a concentration of national advertising at the time the local promotions are in full swing," he added.

The electrical appliance, campaign periods and themes are:

Clothes Dryers (Spring) — January, February and March—"From where I Sit Clothes Dry Better Electrically."

National Electrical Week — Feb. 10-16—"It's National Electrical Week . . . Live Better . . . Electrically."

Ranges (Spring) — March, April, May—"For a 'Stay-Clean' Kitchen—nothing measures up to Electric Cooking."

Water Heaters—March, April, May —"Why Worry—Get an Electric Water Heater and Live Better . . . Electrically."

Electric Housewares (Spring) — May, June—"Give an Electric Gift for (occasion—weddings, anniversaries, graduation)."

Food Freezers—May—August—"A Food Freezer—Frees Her!"

Ranges (Fall) — September, October, November—(to be announced).

Clothes Dryers (Fall) — September—November—(to be announced).

Electric Housewares (Fall) — November, December — (to be announced).

HOUSEPOWER — February, March, April—"How's Your HOUSEPOWER Rating?" and September, October, November—"Live Better . . . Electrically with full HOUSEPOWER."

New Homes—year-round program.

Residence Lighting — year-round program—"Light for Living."

Air Conditioners, Dehumidifiers—May, June, July, August, and Dishwashers, Disposers—September, October, November.

EEI promotional material will be available in kit form for each campaign except Residence Lighting and the last named program.

A check for $10,000—first prize in the national "How's Your HOUSEPOWER?" contest sponsored by EEI—is presented to Mrs. Mary Brown of Philadelphia by Frank Kitzmiller, second from right, HOUSEPOWER program manager for EEI. M. I. Allen, left, vice president of the Philadelphia Electric Co., and G. E. Whitwell, president of the Philadelphia Electric Association, look on.

Philadelphia Mother Wins Top HOUSEPOWER Prize

THE $10,000 grand prize in the $100,000 national "How's Your HOUSEPOWER?" contest sponsored by Edison Electric Institute was won by Mrs. Mary Brown, a Philadelphia secretary and housewife.

Mrs. Brown's winning entry was selected from the 25 top monthly winners in the contest which ran from May through September. A panel of five judges selected the winners on their ability to properly fill out a 12-part entry blank and on the quality of their written answers completing the statement, "It's smart to invest in full HOUSEPOWER because. . . ."

The prize money will be used "to help less fortunate members of my family," Mrs. Brown said, and to help her husband pay for their home. The Browns live at 1314 North 57th St., Philadelphia, and have two adult children. Mr. Brown is a receiving supervisor at the John Wanamaker Co.

The $100,000 contest was designed to help educate the public in the recognition and aims of the HOUSEPOWER program and to update the wiring in an estimated 20,000,000 homes. The contest attracted 316,771 entries from all parts of the country.

Judges who selected the grand prize winner were: Ralph J. Brown, G. E. Supply Co., Bridgeport, Conn., president of the National Association of Electrical Distributors; Arthur E. Bertke, Bertke Electric Co., Cincinnati, chairman of the Business Development Committee of the National Electrical Contractors Association; Steve Feinstein, Magee's Inc., Boston, member of the board of the National Appliance, Radio and TV Dealers Association; Matthew W. Del Gaudio, member of the board, American Institute of Architects, New York, and Carl T. Mitnick, Merchantville, N. J., treasurer of the National Association of Home Builders.

Power Plant Design for Large Liquid-Cooled Generator

By J. P. Fitzgerald and C. F. Paulus

Senior Engineer and General Supervising Engineer, The Cleveland Electric Illuminating Co.

Presented before the Electric System and Equipment Committee, Edison Electric Institute, Cleveland, Ohio, Oct. 15, 1956

THE first turbine generator with a liquid—cooled armature was phased-in on March 17, 1956, as Unit No. 4 at the Eastlake Plant. Eastlake is the newest of four plants on the Cleveland Electric Illuminating Co. system. It is also our first development at a new location for many years. The first unit was placed in service in 1953. Because this plant was developed at a new location and was thus free of many restrictions it proved to be an excellent opportunity to study new approaches to the numerous problems found in a power plant. In this very favorable atmosphere we were able to develop many new economies.

A basic philosophy for a modern unitized plant was presented to this committee at the meeting in St. Louis in February of 1953. This paper, "Electrical Utilization Equipment in the Power Plant" covered the technical and economic aspects associated with the development of the one line diagram of the main circuits in the plant and the transmission yard. It also discussed in considerable detail the development of an auxiliary supply and start-up system through which it was possible to serve units up to 450 megawatt by standard switchgear.

Some of the proposed features unique at the time covered such matters as multiple boards, double transfer busses, selective transferring in random order and the over-exciting of motors. The ideas expressed in this 1953 paper were developed and applied at the Eastlake Plant. The principles have been subjected to field tests and have established a service record which, for Unit No. 1, is in excess of three years. The performance of the plant has been very satisfactory.

The entire design of this plant was accomplished within the Illuminating Co. organization. The overall performance is best evaluated by a net heat rate of 9,336 Btu per kilowatt hour for the last several months, a building volume of 17.5 cubic feet per kilowatt and an overall cost for all investments on the plant site of less than $117 per gross kilowatt. The costs cited include engineering and supervision, interest during construction and all taxes. Gross kilowatt as here used is the normal loading of the machines. Plant use is 6.2 per cent.

This excellent achievement is in large part due to the fact that we have a very close association between the various design and operating groups which makes it possible to obtain the maximum contribution from everybody in the organization and to design for the greatest economy for our particular operating requirements.

The installation of Unit #4 is similar to the other three units except that its larger rating presented problems which, when solved on an economic basis, indicated different treatment. This unit has several unique features which merit discussion in greater detail. The turbine itself is a tandem-compound triple-flow unit operating at 2,400 pounds at the throttle with 1,050° primary steam pressure and 1,050° reheat.

The turbine is rated at 208 megawatts and normally operates at 240

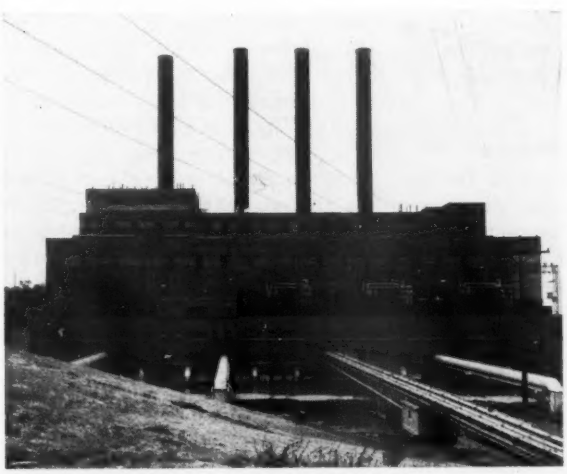


Fig. 1—Eastlake plant of CEI, showing transformer shelf.

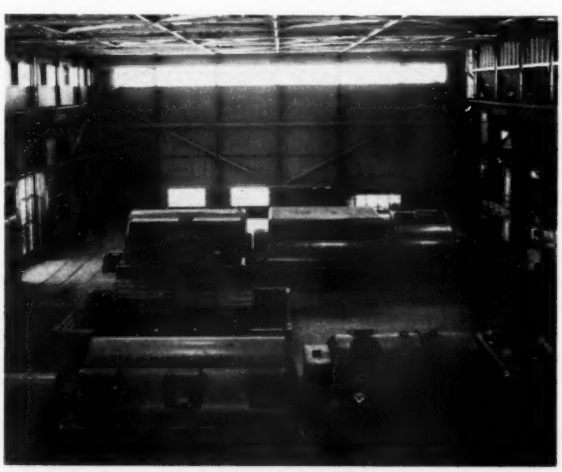


Fig. 2—Unit 3 (foreground) and Unit 4 turbine-generators.

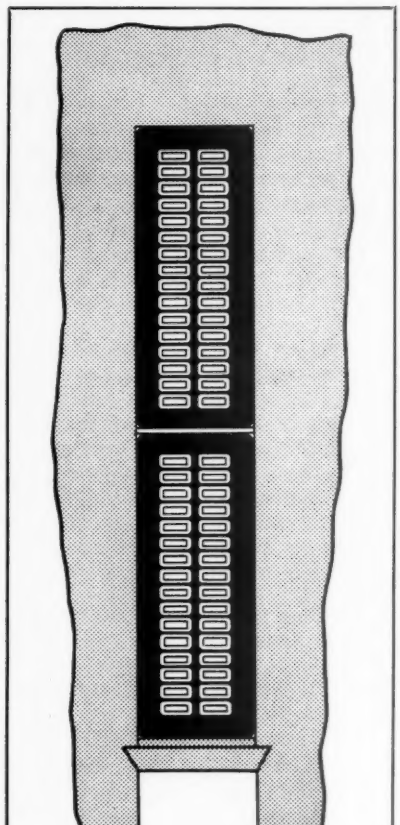


Fig. 3—Section through liquid cooled armature bar showing tubular strand construction.

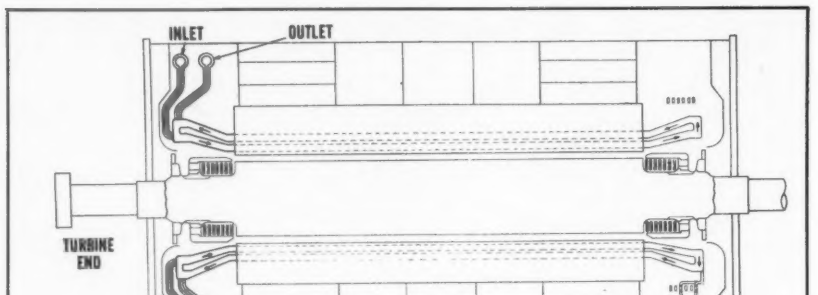


Fig. 4—Diagram of conductor cooled armature winding.

megawatts with a net heat rate of 9,145 Btu per kilowatt hour. The generator is rated 260 mva with 30 pounds hydrogen. As has been our practice at other locations, we employ condensate cooling for the generator. This is our first machine which does not have a shaft driven exciter. There is a motor generator exciter located in the basement and there is no spare.

The loads we normally carry on these machines do not represent their maximum capability. None of the auxiliaries are overloaded and there is an adequate margin in the controls for further maneuvering. The three older machines have been operating at a normal load of 140,000 kw under comparable conditions.

The liquid-cooled stator of Unit No. 4 generator is probably the most interesting of the new features, since it is the first employing this type of cooling. The gap pick-up principle employed for conductor cooling the rotor has been used before on a rotor of conventional size. This is the first rotor using gap pick-up which has been designed to capitalize on its greater cooling ability.

Because of the developmental nature of this machine, we early agreed with General Electric that extensive tests should be made both at their factory and at our station. We participated in numerous engineering conferences during the design and manufacturing stages so as to be intimately acquainted with the many design innovations and construction details and to incorporate our operating requirements in the design. We'd like to briefly describe some design features and present the highlights of our station load test results. A complete description of the generator design, as well as the factory test results, is available from the company.

Eddy Currents Reduced

The cooling liquid, which for our machine is 10CI Transil oil, passes through the hollow copper strands of the armature bar as shown in Figure 3. The tubular strands are transposed throughout the length of the bars to reduce eddy currents.

The diagram of the generator in Figure 4 shows the flow of oil through the armature bars and presents a simplified version of the external oil system. The oil flows from the inlet header at the turbine end through the bar nearest the air gap, then through the end turn at the collector end and returns to the outlet header by the bottom bar of the same coil, which is in another slot. It then flows through the external cooling and pumping circuits.

Figure 5 is a picture of the completed winding at the turbine end of the generator. The black taped portions are the end turns of the windings while the silicone rubber bellows cover the flexible connections to the inlet and outlet oil headers, which are on the periphery of the stator core.

The diagram and the graph on Figure 6 illustrate the temperature profile of the oil as it passes through an armature coil. The gas flow through the stator iron is shown at the top of the diagram. The test readings were made at the factory from a series of thermocouples which were installed in direct contact with the armature copper of a test coil. This test coil was replaced with a standard bar after completing the tests. The curve demonstrated that the temperature rise was greater through the armature bar adjacent to the air gap, since the top bar had higher losses due to eddy currents. Also the oil was cool through this portion of the coil so that most of the heat flow was into the oil.

On the return path, less heat was generated in the bottom bar and this resulted in a lower temperature rise of the oil in this portion of the coil. Also, since the oil had been warmed up in reaching the collector end, a greater portion of the heat flowed through the bar insulation

to the stator iron and gas passages.

The external oil cooling system has been designed for automatic operation with a maximum of flexibility and reliability. In addition to cooling, the system has the basic functions of maintaining a specific pressure on the cooling liquid and providing leak detection and protection. The diagram on Figure 7 shows the arrangement of the system. In most cases duplicate or spare capacity has been provided to allow maintenance without reducing load. The external equipment, consisting of oil storage tank, circulating and vacuum pumps, pressure regulators and coolers, is located on the basement floor underneath the generator. Approximately 600 gallons of oil circulates in a closed system. Of this amount 200 gallons are kept in reserve in the storage tank.

Gas Analyzer Used

Hot oil under vacuum flows from the discharge header to a 600-gallon oil storage tank, which it enters through a spray nozzle. Vacuum pumps, one of which is on standby for emergencies and is started if the low vacuum alarm operates, maintain a 28-inch vacuum in the tank. Upon sounding the low vacuum alarm, the vacuum pump discharge can be by-passed through a gas analyzer to determine whether an air leak or a hydrogen leak is causing the low vacuum. If it is a hydrogen

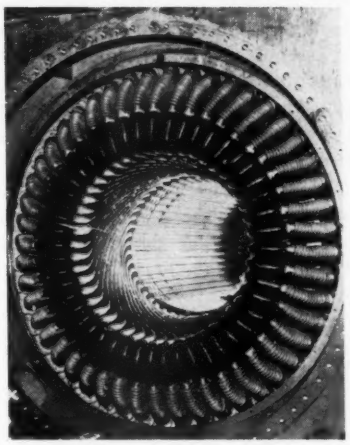


Fig. 5—Completed stator winding viewed from turbine end.

leak, this indicates a leak inside the machine, since the hydrogen is at higher pressure and will leak into the oil rather than the oil entering the machine gas passages.

The oil level in the storage tank is monitored by high and low oil level alarms and sight glasses. Operation of the high level alarm, which indicates incomplete circulation of the oil, shuts down the vacuum pump; the low level alarm indicates a leak in the exterior oil system and de-energizes the circulating pump.

There are two 20-horsepower oil circulating pumps. One of them is normally in stand-by but is energized if the main outlet oil pressure falls below 70 psig or if the differential pressure between hydrogen and oil increases to five psig. Pressure relief valves recirculate oil to the storage tank if the pump discharge exceeds 90 psig.

A pressure regulator on the pump discharge, again with a duplicate regulator in stand-by, automatically maintains the oil pressure at the generator three psig below the hydrogen pressure. In the event that the hydrogen pressure drops to 9½ psig the spring loaded regulators close, opening a by-pass which permits a flow of 35 gpm through the oil system to maintain some cooling action in the stator. Outlet pressure on the regulators dropping to five psig indicates loss of oil flow and the generator load is automatically reduced to half load.

Any two of the three oil-to-water coolers (in our case the water is condensate) are adequate to maintain full load. They are so valved that any one can be by-passed without interfering with normal operation. The oil filters can be operated in the same manner.

Remote Control

All of the abnormalities, and the automatic operations to correct them, are alarmed at a control panel located in the steam control room. Remote control of oil and vacuum pumps is also provided at this location. Cold oil and hot oil temperatures are indicated in the steam control room and recorded on a multi-point recorder in the electrical control room.

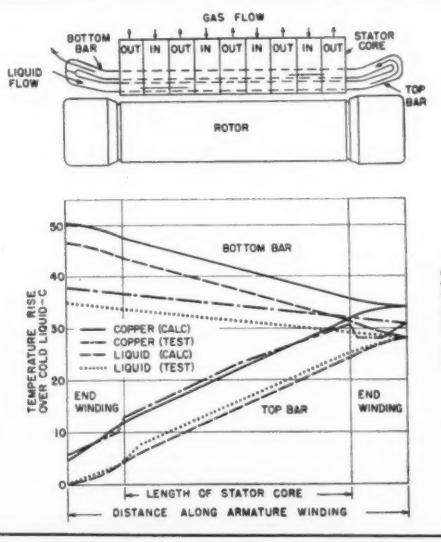


Fig. 6—Profile of armature coolant temperature rise.

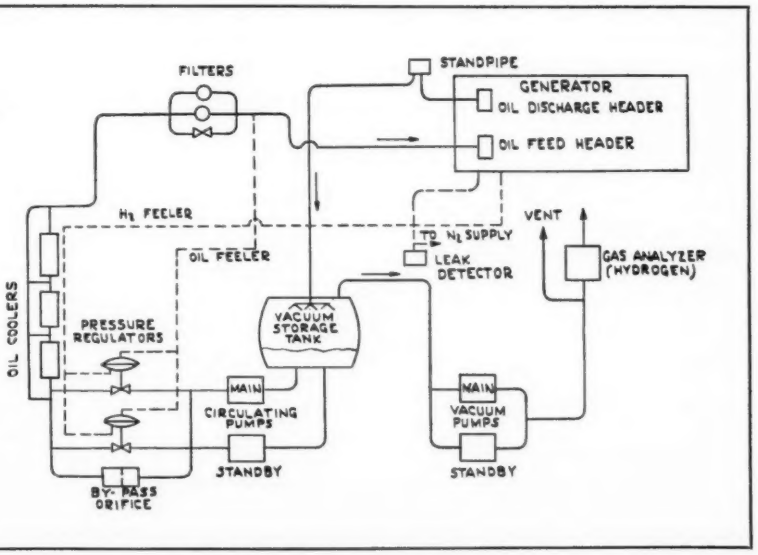


Fig. 7—External armature coolant system.

Each insulated connection from the oil header to the armature bars within the machine is guarded by the rubber bellows shown on Fig. 5. The chamber thus provided within the bellows is connected to a collector pipe going to a sight gauge and alarm located outside the generator.

On start-up the machine is purged with CO_2 in the normal manner. The air space within the insulator must also be purged and this is done by admitting nitrogen through the leak detection system. Nitrogen, rather than CO_2, is used to prevent freezing in the passages during purging.

Full load tests demonstrate that it takes only two minutes to reach winding temperature limits after oil flow stops. Consequently, loss of oil flow from any cause mentioned above automatically reduces the machine to half load by operating the load-limit runback. Our specifications required operation at half load with loss of oil flow; actual tests confirm this.

Figures 8 and 9 show curves of test results from the extensive load tests conducted at Eastlake. These tests were conducted for a period of five days, 24 hours a day with three or four load levels at each level of hydrogen pressure. Also, three test runs were made in nitrogen to verify its air-cooled rating. Nitrogen was used instead of air, since it has nearly the same density. This enabled us to safely purge the hydrogen with the machine running, thus avoiding two shutdowns during the tests.

It took three to four hours to complete a test at each load level. Readings were taken at half hour intervals until three successive half hour intervals showed no more than one degree temperature deviation at any one of the 52 rtd and 29 thermocouple points being read. The highest load at each gas pressure was the rated kva for that particular pressure.

The curves in Figure 8 show the effect of gas pressure on field temperature rise. The permissible temperature rise at 30 psig hydrogen pressure by ASA C50-1955 is 74 C above 46 C cold gas. The 30# H_2 curve shows that we are well below this.

Oil Rise Shown

The curves of Figure 9 show the oil rise, as measured at the discharge oil header, at various loads for each gas pressure. The oil temperature rise at rated load is well within the design limits of 50 C rise set by the manufacturer on this prototype machine. Since the oil pressure is automatically maintained three psig lower than the hydrogen pressure, the oil flow is automatically adjusted to correspond to the permissible capacities at the various hydrogen pressures.

Our experience, both in tests and in normal operation, has shown that stator temperatures, as indicated by rtd's between armature bars and thermocouples in the oil, respond much more quickly to load changes than do those of conventional machines. The temperatures level off quickly following load change. The tests demonstrated that the rtd's imbedded in the stator bar insulation are affected to a considerable degree by their location in relation to the gas passages in the stator and air gap.

Thus, their readings can vary over a wide range along a bar, depending upon whether they are located near hot or cold gas passages. Since the armature winding hot spot is located at the oil discharge end of the bar, as shown in Figure 7, the hot oil temperature is within a few degrees of copper hot spot temperature. This, together with the fact that the hot oil temperature responds even more quickly to load changes than the rtd's, gives the operator much quicker, more reliable indication of any abnormalities which might occur and reflect themselves in the form of excessive stator heating. This represents a decided improvement in our ability to accurately measure generator heating.

Because this type of cooling permits much larger generating capacity per pound of metal in the generator, significant reduction in building cubic requirements can be achieved. This is especially important if a new high-capacity unit must be placed in an existing station and use the same turbine hall width and crane spacing. This was the case at Eastlake, where Unit No. 4 is placed next to three new machines, each about half the capacity (156,250 kva) of Unit No. 4. A comparison of weights and dimensions is given in Table I for Unit No. 4 and Unit No. 3. These two machines were installed only 18 months apart.

Our experience with conductor-cooled machines has been quite satisfactory. In fact, we are currently in the process of designing the installation of two very large conduc-

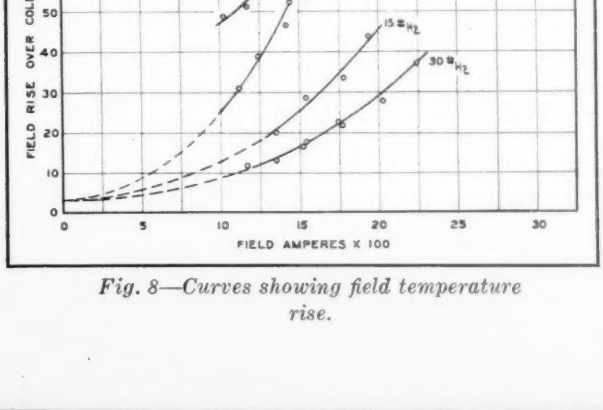

EASTLAKE NO. 4 GENERATOR
260,000 KVA, .80 PF, 64 SCR, 18 KV, 30 #H2
STATION LOAD TESTS
FIELD TEMPERATURE RISE OVER COLD GAS
FIELD RISE OVER COLD GAS °C
½ #NITROGEN
½ #H2
15 #H2
30 #H2
FIELD AMPERES X 100

Fig. 8—Curves showing field temperature rise.

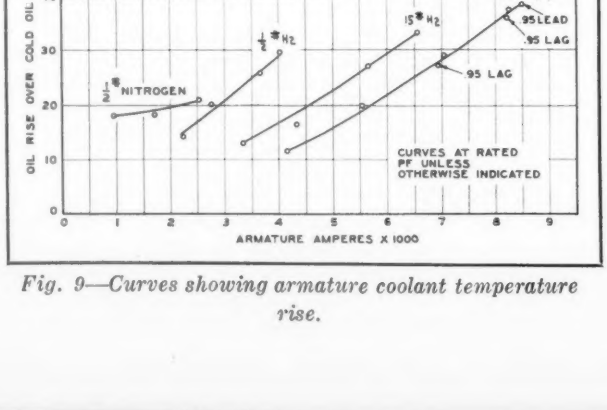

EASTLAKE NO. 4 GENERATOR
260,000 KVA, 80 PF, .64 SCR, 18 KV, 30 #H2
STATION LOAD TESTS
COOLING SYSTEM OIL RISE OVER COLD OIL VS. ARMATURE AMPERES
OIL RISE OVER COLD OIL °C
½ #NITROGEN
½ #H2
15 #H2
30 #H2
95 LEAD
95 LAG
95 LAG
CURVES AT RATED PF UNLESS OTHERWISE INDICATED
ARMATURE AMPERES X 1000

Fig. 9—Curves showing armature coolant temperature rise.

tor-cooled generators: a 320,000 kva liquid-cooled generator at our Ashtabula Plant and a 297,000 kva inner-cooled machine at Avon Plant.

The electrical connections to the generator were designed for 10,000 amperes at 18,000 volts, or 300 mva. The field tests that have been made on this generator indicate that uprating is possible. We have found that because of the forced cooled feature we can up-rate the bus. It may be necessary to ventilate the neutral connection which is now fully enclosed and self-cooled.

Arrangement Is Simple

The forced cooled arrangement is quite simple. Cold air is blown into the housing of the middle phase at the generator terminal. It flows through and about the conductor inside the isolated phase bus duct to the main transformer. Here it splits into two paths and passes through arc cooling grids to the two outside busses and flows back to the generator terminals. The cooling grids are to condense any copper vapor created by a short circuit and insure its going to ground so as to prevent the vapor from creating a conducting path to the unfaulted phases. From the generator terminals the warm air flows through a duct to the air-to-water coolers and then through a single duct to the fan and repeats the cycle. There is a filter on the low pressure side of the fan through which air can either enter or leave the system. This permits equalizing the pressures between the duct at this point and the room in which the fan is located.

Force cooling the bus has several advantages compared to allowing all heat to be radiated. The size of the bus and the housing is reduced, which helps the space problem. Within a power plant there are many temperature zones. Any self cooled apparatus such as a bus should be designed for a specific ambient condition. With a forced cooled bus this is not necessary. Bus temperature is controlled by the fan size, cooling water temperature and heat exchanger capacity. The bus can be designed to operate at any temperature desired as the designer now controls the ambient about the conductor. Good engineering dictates that it be designed for maximum economy. This is at that temperature

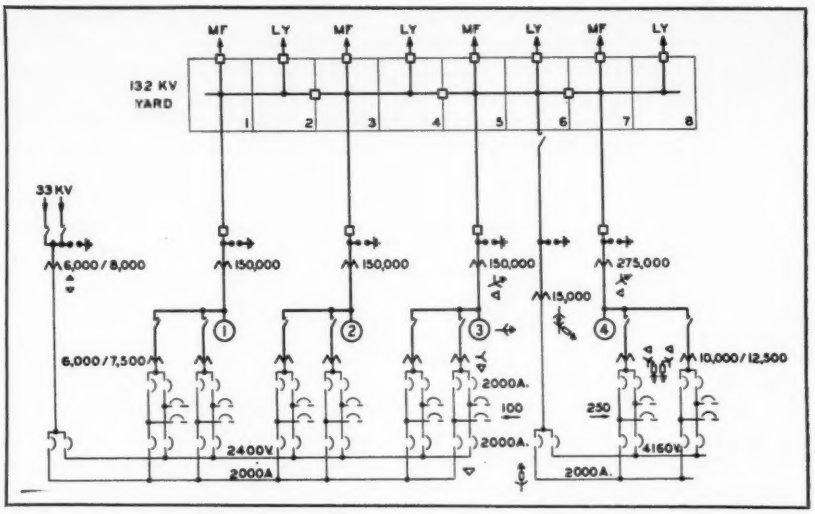


Fig. 10—One-line diagram of main and auxiliary circuits at Eastlake.

Fig. 11—Electrical control room.

where the cost of further increase in air flow and improvements in heat exchanger performance would exceed the reduction in I^2R losses caused by the lowered resistance brought about by the lower temperature.

The design of an auxiliary system for a unit of this size presented special problems. These included starting auxiliary motors as large as 4,000 horsepower and serving an auxiliary load totaling 20,000 kva. The multiple-bus auxiliary system shown on Figure 10 for Unit No. 4 will admirably meet these requirements without exceeding the capacity of standard 4,160 volt 250 mva switchgear. It also provides the necessary emergency and start-up facilities. This is the same basic system used for the other three units except that 4,000 volt motors must be used with Unit No. 4.

Two voltages are employed for the auxiliary drives: 4,160 volts resistance grounded and 440 volts ungrounded. The motors are normally over-excited from five to seven per cent. By this technique, with a slight increase in iron losses, we greatly improve the starting ability of the motors as well as their ability to ride through voltage dips. The diagram shows that these motors are fed from four busses which are in turn fed from two station service transformers for normal use.

There are two transfer buses for start-up purposes and emergency operation. In normal starting and stopping all transferring is done closed-circuit. Automatic transfer is, of course, open-circuit and occurs only upon loss of the machine and only in the direction from normal to start-up source. Any board is prevented from transferring if there is

trouble on the board. Auxiliaries which are not required after the machine has been lost will be tripped at the board and not transferred. This is done to reduce the magnitude of the inrush when the boards are fed from the new source.

The boards will not be connected to the start-up source unless the new voltage is adequate and the connection is delayed until the back emf is so low that there is no danger of injuring the motor should it be connected to an out-of-phase source. The time required for this transferring thus varies with the rate of voltage decay on the particular board and this is a function of the number of motors connected to that board. In each case the connection to the new source is made at the first safe moment. Because of this it is very unlikely that several boards will be tied to the new source at the same time. This random closing contributes to keeping the voltage dip on the start-up source to a minimum.

New Units Engineered

We are currently engineering two new units, one of which is supercritical, and are continuing the same practices relating to the auxiliary system. We have futher developed the basic principles by using split windings on the start-up transformers and tandem feedwater pump motors for the super-critical unit. With this arrangement we feel that we can use 250,000 KVA gear and supply auxiliary loads as high as 12,000 hp. This should make it possible for us to go to units as large as 400,000 or 500,000 KW capacity, even if they are supercritical.

For Unit No. 4 we continued certain practices inaugurated with Units 1, 2, and 3 which we had found successful. There are no imbedded conduit. All circuits, both power and control, are laid in trays both indoors and outdoors. The entire ground system is welded and installed overhead. All earthing electrodes are iron. The plant is completely unitized. This applies to all auxiliary and battery circuits as well as the main circuits. The only tie between units is the 132 KV bus in the transmission yard. All electrical control boards are located on the same floor and arranged in a segmented circular fashion with all control and relay panels facing the operator. This is shown on Figure 11.

The first three units at Eastlake represented a very sharp simplification of the main and auxiliary circuits when compared to previous practices. For Unit No. 4 these practices were largely continued and expanded. Operating experience has been very favorable and in the two new installations we are now engineering we are repeating most of these practices including the use of conductor cooled generators at two installations and forced cooled busses in one case. Many of these new developments have demonstrated operational advantages as well as appreciable savings in the cost of both material and installation.

We feel that by and large these practices have made a significant contribution to the very favorable overall results we obtained at this plant, as measured by its cost per KW as well as cubic feet per KW. We are of course trying to improve

(*Continued on page* 420)

EEI Survey Indicates No Let-Up in Electrical Power Expansion

BEGINNING with 1956 the second decade of the biggest expansion program in the history of the U. S. electric power industry starts off with nearly 50,000,000 kilowatts of additional generating capability already on order, under negotiation or installed, according to the latest power survey of the Edison Electric Institute.

This is almost equal to the total generating capability of all electric generating plants in 1946. Scheduled additions for 1957, 1958 and 1959 alone total 35,000,000 kw, or more than half of all installations in the past decade.

Orders generally are placed two to three years in advance of installation. While orders for 1959 are not yet complete, orders or negotiations for 750,000,000 kw for 1960 and beyond are already on the books. Atomic power projects represent about 1,000,000 kw of the 50,000,000 total presently on order.

The present Power Survey is the 20th in a semi-annual series of reports started in 1947 by the Institute's Electric Power Survey Committee. Its Chairman is Arthur S. Griswold, of The Detroit Edison Company. The most complete study of its kind, the survey includes forecasts of peak power demands and supply capabilities on a regional and national basis. It also presents information on scheduled production of heavy electric power equipment and open manufacturing capacity. The periodic survey is prepared in cooperation with power systems throughout the country, and with equipment manufacturers.

In releasing the report Edwin Vennard, Vice President and Managing Director of the Institute, called attention to the following highlights among the survey findings:

Total generating capability of U. S. electric power systems at the end of this year (as estimated for 97% of the industry) will be about 123,000,000 kilowatts as compared to 116,000,000 at the end of 1955.

Scheduled generating capability already estimated for the end of 1959 is almost 160,000,000 kilowatts—37 per cent more than capability at the end of 1955.

Of the 523 generating units scheduled in the present expansion program, 386 are thermal, totalling 43,138,900 kilowatts. This includes 1,000,000 kilowatts in atomic power projects. Capacity-wise, total thermal units account for 87 per cent of the scheduled expansion. The balance is made up by 137 hydraulic units with a total capacity of 6,388,790 kilowatts.

Peak load for the country as a whole in December of this year is estimated at 106,000,000 kilowatts as compared to 98,000,000 kilowatts last year. The December peak load for 1959 is estimated at 132,000,000 kilowatts.

Gross margin (the difference between maximum generating capability and peak demand) is estimated, for December of this year, at 15.5 per cent. By 1959 this should increase to 20.5 per cent.

Size of thermal generating units continues to increase, with the largest now on order rated at 450,000 kilowatts. In most cases, manufacture of heavy electric power equipment is scheduled at record rates.

For helping save the life of Vehicle Driver J. J. Mott, fourth from right, these employees of the Alabama Power Co. were presented EEI Resuscitation Medals and Certificates of Assistance. Certificates were awarded to, from left: R. L. Pittard, J. H. White and J. E. Dean; medals to A. L. Williams, fourth from left, and W. M. Owens, right of Mr. Mott, J. R. Flippo, second from right, and F. A. Morrow, Jr. Also, not pictured, H. Y. Lynn received a medal and Lorenza Stone a certificate.

EEI Presents Two Resuscitation Awards

17 Certificates of Assistance Also Given to Employees of Alabama Power Co. and San Diego Gas & Electric Co. for Saving Two Lives

TWO additional EEI Resuscitation Awards and 17 Certificates of Assistance have been received by employees of two electric companies for their successful efforts in saving the lives of fellow workers.

Recognized as one of the industry's most honored awards, the medal, while primarily a recognition of the recipient's heroic action, points up also the value of the electric company's safety program. The medal serves to encourage the use of approved manual resuscitation techniques and to honor employees whose application of the techniques, many times at great personal risk, results in the saving of human life following electric shock.

The medal is symbolic of the life-giving power that can be transmitted through the hands of an employee performing resuscitation to a co-worker felled by electric shock. The phrase on the face of the medal "*Gratia Dei per Manus Socii in Opere*," which translated means "By the Grace of God, Through the Hands of a Fellow Worker."

Reviews of cases for which Resuscitation Awards have been made since September, 1956, are presented here.

GENE G. LAKE

San Diego Gas & Electric Co.

After climbing a pole to help replace two phases of a de-energized 12-kv circuit, David L. Rutter, lineman with the San Diego Gas & Electric Co., at about 4 p. m. on March 12, 1956, accidentally touched a 12-kv energized conductor with his right hand. His left hand at the same time contacted a deenergized 12-kv conductor which was grounded at the next pole.

Lineman Gene G. Lake, who was climbing the pole to assist Mr. Rutter, heard a noise and upon looking upward saw that Rutter was apparently unconscious and the upper part of his body was leaning against a fibre shield which had been placed on the energized 12-kv conductor in the pole pin position on the east side of the pole. His head was slumped backward.

Lake assumed a position on the pole so that he could perform artificial respiration. Using his right hand, Lake struck Rutter behind the knees to dislodge him and cause him to slide from the shielded conductor. Rutter then slumped in his belt, his feet and arms extending between the double crossarm on which he had been standing. Lake applied pole top artificial respiration for about five minutes until Rutter began to breathe irregularly. Shortly afterward, Rutter "began to mumble" and within approximately one minute was rational.

Lineman A. Q. Rojas at this time climbed the pole and removed Rutter's climbers. Another lineman, D. E. Riley, climbed the pole and rigged three-quarter inch line to lower Rutter. Lineman C. W. Dukes climbed the

pole to the four-kv level and installed rubber goods on the energized conductors. D. E. Mohr, lineman, climbed the pole to the secondary level to assist in lowering Rutter through these secondary conductors to the ground.

The victim was removed to a hospital where he was treated for first, second and third degree burns of both hands and forearms. It appeared that the left little finger and right ring finger would require amputation and possibly two or three other fingers with extensive plastic work to be done. This would be accomplished over a period of several months.

The alertness and action of Gene G. Lake earned him the EEI Resuscitation Medal and Certificates of Assistance were presented to Foremen M. E. Van der Walker and L. R. Fields; Linemen D. E. Riley, C. W. Dukes, D. E. Mohr and A. Q. Rojas; Vehicle Operators V. R. Gilliland and W. S. Row, and Groundmen George Brunner, Lester Hastings, R. S. Isom, R. A. Mason and R. D. Williams.

The awards were presented at a dinner meeting on Sept. 25 by E. D. Sherwin, president of the company. Accounts of the presentations appeared in the Sept. 26 issues of the San Diego *Union* and *Evening Tribune*. Rutter and Lake were interviewed on the "People in the News," a television news program which is seen on KFMB-TV in San Diego, Calif.

J. R. FLIPPO
A. L. WILLIAMS
H. Y. LYNN
W. M. OWENS
F. A. MORROW JR.
Alabama Power Co.

While helping to pull slack from a conductor that was being installed on crossarms under a three-phase 12-kv circuit in Montgomery, Ala., March 2, 1956, J. J. Mott, Alabama Power Co. truck driver, was rendered unconscious and stopped breathing when the conductor contacted a 12-kv energized conductor.

Groundman J. R. Flippo, who was helping Mott pull wire, also received a shock but soon recovered and immediately began to administer artificial respiration. Foreman J. E. Dean and Lineman J. H. White removed the wire from Mott's right hand. They turned the injured man over. Lineman A. L. Williams pulled his tongue from his mouth and Flippo began giving artificial respiration. W. M. Owens and Williams relieved Flippo. Mott showed signs of life after several minutes. Groundman H. Y. Lynn and Safety Engineer F. A. Morrow Jr. continued administering artificial respiration. After about 15 minutes, Mott's breathing became spontaneous.

When the ambulance arrived, the injured man received oxygen from attendants and he was removed to hospital, where the doctor treated him for three small burns of the plantar surface of the right foot. The doctor advised that Mott could resume restricted work the following day.

For helping to save the life of Mott, the EEI Resuscitation Medal was awarded to J. R. Flippo, A. L. Williams, H. Y. Lynn, W. M. Owens and F. A. Morrow Jr. Certificates of Assistance were presented to Linemen J. H. White, Foreman J. E. Dean, Timekeeper R. L. Pittard and Assistant General Foreman Lorenza Stone, who also had aided in the resuscitation. The story of the rescue and presentation, as well as pictures of Mott and several of the men who helped to save his life, was featured in the October, 1956, issue of *Powergrams*, publication of Alabama Power Co.

Iowa Type Survivor and Average Remaining Life Tables for Indicated Ages and Average Lives

March, 1956

Issued by Depreciation Accounting Committees of Edison Electric Institute and American Gas Association

Available at $3.00 from:

Edison Electric Institute
420 Lexington Ave.
New York 17, N. Y.

Gene Lake, seated center, received the EEI Resuscitation Medal for helping to save the life of David Rutter, right of Mr. Lake, a fellow lineman of the San Diego Gas & Electric Co. Certificates of Assistance were received by A. Q. Rojas, seated left, and V. R. Gilliland, seated right, and standing, from left: R. D. Williams, W. S. Row, L. H. Hastings, R. A. Mason, D. E. Riley, C. W. Dukes, L. R. Fields, M. E. Van der Walker and George Brunner. Robert Isom and D. E. Mohr are not shown. Also shown are, seated: H. A. Noble, vice president, second from left; E. D. Sherwin, president, third from left, and C. J. Nevitt, Electric Transmission & Distribution. Standing right is E. M. Foster, general line foreman of the company.

The Credit Picture

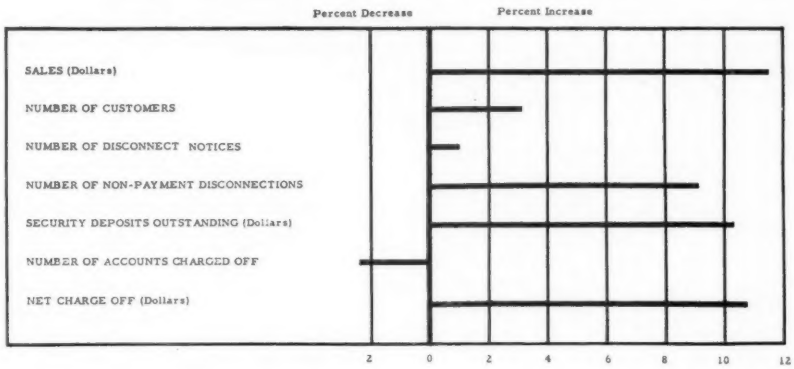
Survey by Customer Collections Committees, EEI Accounting Division and AGA Accounting Section, Shows Total Sales, Customers Continue to Rise

THE Credit Picture for the first half of 1956 compared to the similar period of 1955 continued, in most instances, to present an encouraging note when viewed nationwide.

The upward trend in total sales continued at an almost identical level as in previous comparable periods although in some areas, residential sales increased percentagewise above other revenue classifications. One section of the country doubled its 1955 growth in the category.

The upward trend was again evident in the number of customers on a national basis although again at a somewhat reduced rate, 3.3 per cent and 3 per cent in residential and total customers respectively in 1956 as compared to 3.4 per cent and 3.7 per cent in the similar six months of 1955. Two areas were consistent with their own past experiences in that their increases in both residential and total customer growth were well below the other areas while three continued their growth at the national average level. The other four areas, as in 1955, indicated much more rapid growth, one as much as 62 per cent above the average of all areas in residential customers and 50 per cent in the total number of customers.

CREDIT AND COLLECTION EXPERIENCE OF U. S ELECTRIC AND GAS INDUSTRIES
Jan. 1, 1956-June 30, 1956 compared to similar period for 1955



In one field, we find that the trend exhibited for the previous six months' analysis has been reversed. From a decrease of 0.8 per cent in disconnect notices issued nationally, we have gone to an increase of 1 per cent as portrayed in the current report. A most interesting observation in this report is the sharp increase in the number of service disconnections for non-payment of bills, from 5.2 per cent to 9.3 per cent. Especially noteworthy is the fact that this increase was accomplished with only a minor increase in the number of disconnect notices issued. The trend toward moderate increases in notices and concurrent material increases in service disconnections prevalent at least in the last two reports would indicate that most companies have adopted a more firm collection policy as regards current or active accounts.

Certainly this trend will prompt further study.

The trend toward more adequate

REFLECTION OF CREDIT AND COLLECTION EXPERIENCE OF U. S. ELECTRIC AND GAS UTILITIES—JANUARY 1, 1956, TO JUNE 30, 1956

Per Cent—Increase or Decrease over Corresponding Period—1955

	New England	*Mid Atlantic*	*East North Central*	*West North Central*	*South Atlantic*	*East South Central*	*West South Central*	*Mountain States*	*Pacific States*	*United States Total*
Sales in Dollars:										
Residential	+10.3	+11.6	+17.5	+15.7	+16.2	+13.5	+10.3	+ 6.9	+26.0	+16.1
Total	+10.9	+ 9.1	+13.9	+12.1	+14.1	+10.2	+10.1	+10.0	+ 8.7	+11.3
Number of Customers:										
Residential	+ 1.4	+ 1.2	+ 3.1	+ 3.3	+ 5.5	+ 5.6	+ 3.9	+ 5.7	+ 4.9	+ 3.3
Total	+ 1.2	+ 1.0	+ 2.9	+ 3.1	+ 5.1	+ 4.6	+ 3.4	+ 5.5	+ 4.6	+ 3.0
Number of Disconnect Notices	−13.3	− 8.9	+ 5.6	+17.0	+13.1	+ 0.2	− 3.9	+51.8	− 3.2	+ 1.0
Number of Non-Payment Disconnections	−11.7	+ 8.5	+20.6	+ 1.1	+10.5	− 2.5	− 1.5	+64.9	+ 9.3	+ 9.3
Security Deposits Outstanding:										
Number	− 0.8	+11.6	+14.1	+17.3	+11.6	− 0.8	− 0.9	+11.4	− 0.2	+ 8.1
Amount (Dollars)	+ 4.3	+ 9.8	+21.2	+10.3	+12.5	+ 3.1	+ 0.6	+ 6.7	+26.5	+10.0
Number of Accounts Charged-Off	+24.8	+ 1.1	+ 5.3	+ 2.2	− 1.8	+15.9	− 1.0	+19.5	−21.4	− 2.5
Net Charge-Off (Dollars)	+34.4	+16.5	+ 7.9	+15.6	−10.1	+16.8	− 5.3	+48.3	+13.6	+10.8
Net Charge-Off (Cents per Customer)	+32.9	+18.2	+ 4.5	+12.8	−14.7	+12.1	− 8.2	+40.0	+ 8.7	+ 8.3
Ratio: Net Charge-Off to Sales:										
Residential	+25.8	+ 6.8	− 8.1	− 0.1	−22.6	+ 4.8	−14.1	+38.7	− 9.8	− 4.1
Total	+21.2	+ 9.2	− 5.2	+ 3.2	−21.2	+ 9.7	−14.0	+35.8	+ 4.5	+ 0.1

security deposit coverage in some areas continues with a national average gain of 8.1 per cent in number of deposits outstanding as compared to the previous reporting period. However, four geographical areas reported nominal decreases. The trend is clearly indicated when we note that the increase in deposit coverage is roughly two and one half times greater than the over-all increase in number of customers. The dollar amount of deposits on hand again increased at a rate greater than the number of deposits, even in the four geographical areas reporting a decline in number. The fact that all areas reported an increase in dollars of deposits outstanding further indicates the trend toward more adequate coverage because of the economic impracticability to restrict amounts and number of bills owing to a minimum before termination of service. It also indicates the efforts of utilities to obtain sufficient security coverage commensurate with the ever-mounting average yearly service usage.

A breakdown of the charge offs evinces an almost identical trend as experienced in the period ending Dec. 31, 1955, in that 65 per cent of the reporting companies suffered increases in net uncollectable losses as shown by the following summary by number and type of company.

Net Charge-Off		Number of Companies
Gas Companies	Increase	12
Combination Companies	"	17
Electric Companies	"	20
Total		49
Gas Companies	Decrease	8
Combination Companies	"	8
Electric Companies	"	11
Total		27

Two factors, the increased number of customers together with a higher average yearly service usage present an ever-increasing challenge to utility collection men to attempt to retard their dollar bad debt losses which, as indicated by the 10.8 per cent increase in amounts charged off for this period are still spiralling upwards in most sections of the United States.

In three of the seven geographical areas, increases in sales helped to bring about a reduction in the ratio of net charge offs to sales. In two other areas, this ratio increased substantially despite favorable sales figures.

A new feature, included in the detailed summary of Credit Picture statistics mailed to each of the 76 participating companies, was a breakdown of the experiences of the individual utility divisions of the combination companies. Through this medium the combination companies can more accurately compare their performance with their counterparts on a nationwide basis.

A careful analysis of the reports submitted by the 76 participating companies indicates several trends which are certainly favorable in the long run to the continued success of the utility industry. A steady consistant growth in the number of customers is evident, but even more vital to the picture is the sharp increase in the dollar value of sales to these customers.

It is unfortunate from a customer relations standpoint that the increase in customers and sales is accompanied by the necessity for an increase in

(*Continued on page* 420)

Major geographic divisions as reported by the Credit Picture

Detroit Edison Selects University for Grant in Dow Fellowship

THE first grant of a newly-created Alex Dow Fellowship in engineering will be offered to a graduate student at the University of Michigan, Walker L. Cisler, president of The Detroit Edison Co., has announced.

The fellowship was established by the Detroit company in memory of Alex Dow, electric power industry pioneer who headed the company from 1912 through 1940. The recipient, to be selected by the university, will be awarded a $1,500 grant, plus tuition, for one year of post-graduate study leading to a master's degree in one of the three engineering fields closely related to the electric power industry.

A grant of $800 also will be made by the company to the department in which the student is to be enrolled. The new grant is subject to acceptance by the Regents of the University of Michigan. It is planned to rotate the award annually among several colleges and universities, each of which will select a recipient.

Labor Organizations

(*Continued from page* 402)

for those who may be affected by changes in work practice, consolidation or elimination of duties, or any other development due to increased efficiency of operations.

In short, discuss with the union every problem related to efficiency and production which concerns employees, and get assurance of cooperation in its solution.

In solving these production problems, the use of reason and logic is not only helpful—but essential—to attainment of the union's objectives. Understanding of the problems must be obtained, however—together with equal understanding of the fundamental economic principles involved.

Understanding will be gained only by a sincere, convincing, tenacious approach—firmly supported by every member of management.

The approach must be continuous—during negotiations—when grievances are processed—as specific problems are initiated for discussion. Most important of all, a constructive attitude toward production and efficiency must be apparent in the day-to-day operations of every supervisor. The cooperation and support of the union can be obtained—but the union cannot—and should not—be expected to do the job. The responsibility for production belongs to management—and this responsibility must be accepted at all levels of management. Any weakness on the part of supervisors will place serious obstacles in the path of solutions to our problems.

Time Now to Check Your Sales Results For EEI Awards

The trade press and EEI are reporting outstanding sales achievements for 1956. Participating companies are urged to check your successful promotions against the awards offered (see below).

Rules governing entries in the 1956 Awards Contests have been simplified. This will encourage companies to submit several entries at less expenditure of time and labor than formerly was spent on one entry. Small and medium-size companies have special classifications in many of the awards.

Awards for Sales Results

George A. Hughes Awards
(Electric ranges and water heaters; commercial electric cooking)

Laura McCall Awards
(Home Service)

George Westinghouse Awards
(Electric Laundry Equipment)

General Electric Company
(More Power to America)

T. W. Martin Award
(Rural Electrification)

Better Light Better Sight Bureau
(Lighting Education)

Lighting Promotion Awards
(Lighting Promotion)

Frank Watts Awards
(Rural Electrification)

Deadlines for entries in above Awards are Feb. 1 or 15, 1957. See EEI folder or individual Award Brochures for specific terms

Valor Award

Instances of Unusual Valor

(Claude L. Matthews Valor Award)

Deadline for recommendations by Chief Executive of Company—Feb. 1, 1957

Annual Report Awards

Annual Reports

(Reddy Kilowatt Annual Report Awards)

Deadline for entries—May 9, 1957

Chief Executives . . . Please Note

Deadline for an entry for the Claude L. Matthews Award for Valor is Feb. 1, 1957.

The recommendation covering an act or acts of extraordinary courage in your company during 1956 must be made by the Chief Executive (or acting representative).

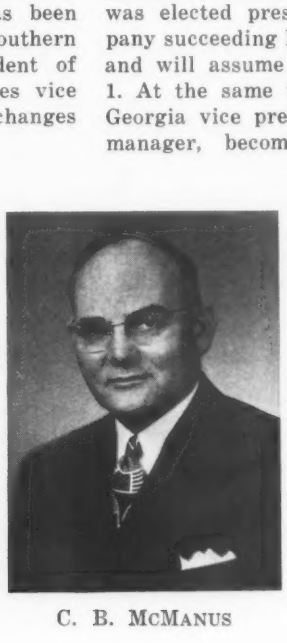
Because the Feb. 1 deadline is near, it is suggested that your recommendation be made now so that a deserving act of valor can receive the national recognition it merits.

Send your recommendation to Secretary, Awards Committee, Edison Electric Institute, 420 Lexington Ave., New York 17, New York.

Personals

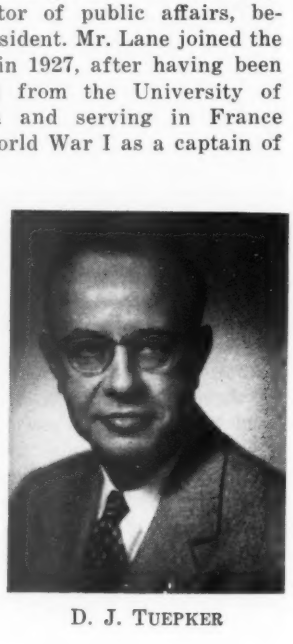
Harllee Branch, Jr., president of the Georgia Power Co., has been elected president of The Southern Co. **C. B. McManus,** president of Southern since 1947, becomes vice chairman of the board. The changes are effective Jan. 1.

HARLLEE BRANCH, JR.



C. B. MCMANUS

JOHN J. MCDONOUGH



D. J. TUEPKER

Mr. Branch joined Georgia Power Co. in 1949, following 18 years as one of the company's general counsel. He was elected vice president and general manager and a director at that time. In 1951, he succeeded Mr. McManus as president. He was elected a director of The Southern Co. in 1953. Born in Atlanta, Mr. Branch was graduated from Davidson College and Emory Law School. Mr. McManus, who will continue his responsibilities in connection with operating problems, joined the Alabama Power Co. in 1917, serving in engineering and managerial capacities. He joined Georgia Power Co. in 1927 as assistant operating manager. In 1945 he was appointed assistant to the president and elected to the board. Two years later he wa elected vice president and director of operations. In 1947 he was elected president. He was chosen as a director of Southern in 1949 and elected president in 1950. Mr. McManus continued as Georgia Power Co. president until January, 1951. He served as Defense Electric Power Administrator in Washington during the Korean War.

John J. McDonough, executive vice president of The Georgia Power Co., was elected president of the company succeeding **Harllee Branch, Jr.,** and will assume that position Jan. 1. At the same time, **J. M. Oliver,** Georgia vice president and general manager, becomes executive vice president and will retain his duties as general manager of the company. A native of Savannah, Ga., Mr. McDonough joined a predecessor of the Georgia Power Co. shortly after his graduation from Georgia Tech in 1923. His first job was as assistant to the manager of the Georgia Southern Power Co. in Dublin. Between 1927 and 1937 he filled various supervisory and managerial posts in several cities. In August, 1937, he was elected vice president and manager of the Rome division. In 1950 he was transferred to Atlanta as vice president and division manager and on April 5, 1951, was elected executive vice president. Mr. Oliver, a native of Dadeville, Ala., is a veteran of 41 years of service with the Georgia Power Co. and associated companies. Following his graduation from Alabama Polytechnic Institute in 1915 he joined the Alabama Power Co., working in the construction and operating departments. From 1916 to 1927 he served as operating engineer. In 1927 he joined the Georgia Power Co. as operating manager. In 1944 he was elected vice president in charge of operations and in 1951 vice president and general manager.

R. K. Lane, the president of Public Service Co. of Oklahoma, has been named chairman of the board, Public Service Co. of Oklahoma, a newly-created position. **D. J. Tuepker** director of public affairs, becomes president. Mr. Lane joined the company in 1927, after having been graduated from the University of Wisconsin and serving in France during World War I as a captain of artillery. In 1928 Mr. Lane was appointed vice president in charge of construction and operation. The following year he was named vice president, Southwestern Light and Power Co., a subsidiary of PSC. He was elected president of PSC in 1939. Under his supervision the company has grown from an electric system serving 72,005 customers in 123 communities to a system serving 237,796 customers in 255 communities. Mr. Tuepker also joined PSC in 1927 when the company bought Oklahoma Power Co., where he had been employed since 1923. He is a graduate of the University of Kansas and has been assistant auditor, assistant purchasing agent, purchasing agent, area manager and director of public affairs.

Vice President W. **D. "Dave" Johnston,** Wyoming Division manager, has retired after 36 years of service with the Pacific Power & Light Co. He was succeeded as division manager by **Verl Hoover,** assistant vice president. Mr. Johnston will serve as advisor to the company and continue as a board member. He began his electric utility career in 1909

with the Telluride Power Co. Here he won a company scholarship and in 1917 was graduated from Cornell University with a degree in electrical engineering. After his service in World War I, Mr. Johnston returned to Casper in 1920 and began his 36 years of service to the Wyoming region. He served successively as general superintendent for the Natrona Power Co. and vice president, general manager and director for the former Mountain States Power Co. before assuming his present position. Mr. Hoover's career with the company spans 27 years, with four years out for military service.

O. J. Miller, vice president and general manager of Duke Power Co. since 1948, was appointed executive vice president of the company. In the utilities business since 1916, Mr. Miller was manager of production and transmission for Tennessee Electric & Power Co. He joined Commonwealth & Southern Corp. in 1940 and Duke Power Co. in 1943. He is a graduate of Ohio State University with a degree in electrical engineering. Also promoted at Duke was **W. B. McGuire,** former assistant general counsel in the legal department, who is the new assistant to the president. He is a graduate of Davidson College and Duke University Law School. Both Mr. Miller and Mr. McGuire are directors of the company.

Watson F. Tait, Jr., vice president in charge of electric operation for Public Service Electric and Gas Co., was elected president of New Jersey Utilities Association. **Charles E. Kohlhepp,** president of Jersey Central Power and Light Co., was elected vice president.

Election of **D. T. Montgomery** as vice president and treasurer has been announced by Northern States Power Co. **G. F. Johnson** was elected vice president - finance. Mr. Montgomery, a veteran of 42 years' service with NSP, served from 1914 to 1926 in branch and division accounting offices of the company. He then transferred to the Minneapolis general office and held successive posts as accountant, auditor, controller and assistant treasurer. Mr. Johnson joined NSP in 1927 after receiving a degree in electrical engineering from the University of Minnesota. He was a rate engineer for 25 years and in 1952 was named operations controller. He has been assistant vice president-finance for a year.

W. E. Hollingsworth, assistant manager of the Georgia Power Co.'s Augusta division, has been elected vice president and named division manager. Educated at Marion Institute, Marion, Ala., and the U. S. Naval Academy, Annapolis, Mr. Hollingsworth became superintendent of the water and light department of Ocilla and joined a predecessor of Georgia Power Co. in 1926 as local manager when the company acquired the Ocilla electric system. In 1935 he was promoted to Tifton district manager; in 1936 to assistant superintendent of the Columbus division; in 1937 to assistant superintendent of the Macon division and in 1946 to Macon division superintendent. In 1953 he was transferred to Augusta as assistant division manager.

Leeds A. Wheeler, graduate of Harvard College and Harvard Law School, has been appointed vice president and general counsel of the New England Electric System. He first came to the system in 1934 as attorney for the New England Power Engineering & Service Corp. and in 1941 was elected vice president of the New England Power Service Corp. He was named general counsel for New England Electric System in 1948.

George R. Fulton, executive vice president of Texas operations, Gulf States Utilities Co., was elected to the board of directors, filling the vacancy created by the recent retirement of **W. R. Bell.** With the company for the past 25 years, Mr. Fulton previously served as vice president in charge of the Lake Charles division. Mr. Fulton began with the Savannah Electric Co. and in 1920 moved to the Baton Rouge Electric Co. He served with several other utilities until 1931 when he was named superintendent of production for Gulf States.

Berkeley Snow has retired as executive manager of the Northwest Electric Light & Power Association after 29 years of service with the organization. He was succeeded by **Alden F. Krieg,** graduate of Oregon State College with an electrical engineering degree, and a long-time resident of Portland. From 1948 to 1954 he was associated with the Portland General Electric Co. in its sales engineering and street lighting departments. For the past two years he was on leave from that company to serve as executive secretary of the Portland Exposition-Recreation Commission.

The Connecticut Power Company has announced the appointment of **Ansel A. Packard** as assistant to President **A. D. Barney.** Mr. Packard was graduated from the University of Maine in 1916 and joined the firm of Stone and Webster. He went with The Connecticut Power Co. in 1917 as an engineer and eventually became manager of the Middletown Division in 1922. He served for six years as chairman of the Accident Prevention Committee of the New England Section of the National Electric Light Association. During 30 years with the Power Co., he has been active in community affairs.

Russell E. Caywood, manager of rates for West Penn Power Co., has been promoted to assistant comptroller of the utility. A veteran of 30 years in West Penn rate work, he recently wrote the book, "Electric Utility Rate Economics." He was graduated from the University of Colorado with an electrical engineering degree and studied economics, accounting and public utility finance at New York University, Carnegie Tech and the University of Pittsburgh.

Creation of a new public service department—a consolidation of the advertising and industrial departments—has been announced by West Texas Utilities Co., with **R. E. Kennedy,** advertising manager, in charge. Mr. Kennedy, who has been with WTU for 23 years, will have a principal responsibility "to assist and cooperate with local and area organizations and agencies in achieving the fullest development and utilization of the resources of the area served by the company." Mr. Kennedy has been in the advertising department since 1943 and its manager since 1946, following his return from World War II service. He is a graduate of Hardin-Simmons University.

James F. Davenport, who started his career with Southern California Edison Co. in 1926 as a draftsman, has been elected executive vice president of the company. He joined SCE shortly after being graduated from Harvard University's School of Engineering. He was promoted to hydro engineer in 1929; superintendent of hydroelectric generation in 1931 and superintendent of generation and assistant manager of operation in 1940. After serving four years in the Air Force, Mr. Davenport returned to SCE in 1946 as an assistant vice president. Elected vice president in 1951, he left again a year later to serve as an administrator for the Defense Electric Power Administration. He assumed the post of vice president and general manager in 1954. He was the United States delegate to the 1956 Committee on Electric Power, a subsidiary organ established by the United Nations Economic Commission for Europe.

Jack K. Busby has been appointed executive vice president and elected a director of the Pennsylvania Power & Light Co. He was vice president and general counsel of the company. Mr. Busby joined PP&L in December, 1951, as general counsel and was appointed to his recent position in June, 1954. A graduate of Princeton University and the Yale School of Law, Mr. Busby was associated with the New York law firm of Simpson Thacher & Bartlett from 1941 to 1951 except for four years with the Navy.

Virginia Electric & Power Co. has promoted **Ray C. Hopkins,** Potomac district manager, to vice president of the company's Western division, a new post. It becomes effective with the retirement of **James M. Wilson,** former vice president of the Western division. Mr. Hopkins served in several capacities with the Stone & Webster Engineering Corp. from 1921 to 1927 before joining VEPCO as executive assistant in Richmond. He was named manager at Fredericksburg in 1931 and was appointed Potomac district manager in 1946.

After 40 years with Carolina Power & Light Co., **Capers J. Curry,** has resigned as secretary of the company. **William L. Yoder,** assistant secretary, assistant to the president and a director, succeeds Mr. Curry. A native of Alabama, Mr. Curry started in the power industry in 1909 with the Alabama Power Co. He joined CP&L in 1916 as auditor, then became assistant secretary and secretary-treasurer. He was a director for nine years and the secretary for 23 years. Mr. Yoder, a graduate of Virginia Military Institute with a degree in electrical engineering, joined the company in 1916. He was named chief of the statistical department and assistant to the general manager in 1931. Mr. Yoder was appointed assistant to the president in 1955.

Ralph P. Wagner, business manager for the Eastern division of the Niagara Mohawk Power Corp. and well known throughout the utility industry and EEI, will retire Jan. 1 to become vice president of two Albany, N. Y., oil development firms. He has been elected vice president of the South Texas Development Co. and Wytex Oil Corp. Mr. Wagner joined the New York Power and Light Corp. in 1929 after his graduation from the University of Nebraska with a degree in both civil and electrical engineering. In 1950, NYP&L was consolidated with Niagara Mohawk Power Co. and assumed the name of the latter firm. His first duty after joining the old NYP&L in 1929 was as supervisor of the company's rates. In 1930 he was promoted to commercial manager. Mr. Wagner was chairman of EEI's Commercial Division General Committee in 1946-47 and supervised the activities of 22 committees. He is a past member of the EEI Rate Research and General Sales Committees. He helped prepare the nationally-accepted Sales Training Course sponsored by the Institute for appliance salesmen. In 1948 he was appointed chairman of the "Better Light Better Sight Bureau." He was chairman of the Utilities Program Committee of Light's Diamond Jubilee.

Walter G. Knickerbocker, general superintendent of meters for The Detroit Edison Co., retired Dec. 1, after nearly 40 years of service with the company. **William J. Piper,** assistant general superintendent of meters, succeeds Mr. Knickerbocker. A former chairman of EEI's Meter and Service Committee, Mr. Knickerbocker is a member of the American Institute of Electrical Engineers, the Michigan Engineering Society and charter member of both the Engineering Society of Detroit and the Society of American Military Engineers. He was graduated from Michigan State University in 1916 with a degree in electrical engineering and joined Detroit Edison's property department in 1917. He was transferred to the meter department in 1924 and was its chief for 16 years. He served overseas as a first lieutenant with the U. S. Army Corps of Engineers in World War I, returning to the company in 1919. Mr. Piper is a graduate of University of Michigan with an electrical engineering degree. He joined the company in 1923 as a technical assistant in the meter department. He was appointed assistant general superintendent of meters in 1954.

Eastlake Power Plant

(*Continued from page* 412)

on this record at our new installations.

COMPARISON OF GENERATOR WEIGHTS & DIMENSIONS

	Eastlake No. 3	Eastlake No. 4
30# H_2KVA Capability	156,250	260,000
Length of Rotor (ft.)	31.5	34
Height Above Floor (ft.)	10.0	13
Field Body Dia. (inches)	39	39
Stator Weight (tons)	248.5	307
Rotor Weight (tons)	43.5	46
Total Weight (tons)	292	353
KVA/ton	535	735

The Credit Picture

(*Continued from page* 416)

dollars retained as security deposits, but it appears that such protection is considered necessary by the majority of companies as the only practicable means of averting greater losses. The material increase in charge offs expressed in cents per customer is a factor of major significance for utility collection and credit managers to observe.

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THOMAS G. DIGNAN.....Boston Edison Co., Boston, Mass.
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JOHN W. EVERS.....Commonwealth Edison Co., Chicago, Ill.
C. E. IDE.....The Toledo Edison Co., Toledo, Ohio
S. R. KNAPP.....The Connecticut Light & Power Co., Berlin, Conn.
C. B. MCMANUS.....The Southern Co. Inc., Atlanta, Ga.
R. S. NELSON.....Gulf States Utilities Co., Beaumont, Texas
W. A. PARISH.....Houston Lighting & Power Co., Houston, Texas
HAROLD QUINTON.....Southern California Edison Co., Los Angeles, Calif.
L. V. SUTTON.....Carolina Power & Light Co., Raleigh, N. C.

(*Terms expiring 1958*)

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R. H. GERDES.....Pacific Gas and Electric Co., San Francisco, Calif.
N. B. GUSSETT.....Iowa Power and Light Co., Des Moines, Iowa
E. L. LINDSETH.....The Cleveland Electric Illuminating Co., Cleveland, Ohio
D. C. LUCE.....Public Service Electric and Gas Co., Newark, N. J.
M. S. LUTHRINGER.....Central Illinois Public Service Co., Springfield, Ill.
C. E. OAKES.....Pennsylvania Power & Light Co., Allentown, Pa.
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K. M. ROBINSON.....The Washington Water Power Co., Spokane, Wash.
L. M. SMITH.....Alabama Power Co., Birmingham, Ala..
HAROLD TURNER.....American Gas and Electric Service Corp., New York, N. Y.

(*Terms expiring 1959*)

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R. G. Rincliffe, W. H. Sammis, L. V. Sutton

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